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## THE EXECUTIVE DIRECTOR'S COLUMN

**I**n July last year, Network published a feature called "The Great Debate" based on a paper titled "Road Cost Recovery: What's the Damage?", prepared for Railways of Australia by Nelson English, Loxton and Andrews, transport consultants.

The article drew attention to the imbalance between spending on roads and on railways in Australia, and to the unfair advantages enjoyed by the road transport industries, rail's main competitor for long-distance freight. The disparity in cost recovery levels between the two modes has been widely acknowledged by authoritative studies.

Now further weight has been added to the argument for rail. The Federal Government has just released the last report prepared by the Inter-state Commission: "Road User Charges and Vehicle Registration: A National Scheme." (The Commission has just been abolished, for the second time.)

The report recommends a program of micro-economic reform in the road transport industry and in the provision, management and use of our road system. Road-user charging arrangements it finds to be inefficient and inequitable, and it proposes a national scheme based on the "user pays" principle.

The report reiterates some of the points made by Network last year. It shows that private motorists are paying an unfair share of the huge costs of Australia's highway network; and that rail's competitors are paying far less than they should.

The Commission also estimates that the socio-economic cost of road crashes is almost \$5 billion annually, no less than 2 per cent of our GNP.

The Commission proposes determining road-user charges on a national basis. Revenue from a suggested mass-distance charge for freight trailers should be returned to the States and Territories for road expenditure. Part of fuel excise would be deemed a road-user charge and dedicated to road expenditure. Rail systems should be exempted from excise duty on diesel fuel, except for an amount designed to compensate the community for their external costs (not quantified by the Commission).

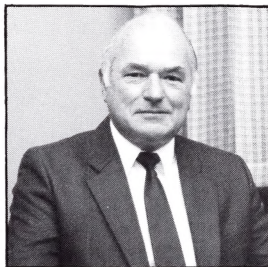
Adoption of the Commission's wide-ranging and far-thinking report would require consensus among State and Federal Governments — something not easy to achieve in Australia's transport field. But its recommendations would go a long way toward putting road and rail at parity. With the true costs of each defined more precisely, the community should benefit from fair competition without hidden subsidies.

The recent rail-sponsored study by Booz-Allen and Hamilton/Travers Morgan has shown that, with unified management and comparatively small investment in infrastructure improvements, inter-system rail can stand on its own feet and be profitable. Sensible charges for road use would assist this process; charges for road freight would reflect the full true costs.

The Federal Government has allowed two months for public comment on the report of the Inter-state Commission. Network readers should study the findings and make their views known.

The focus on the need for change in Australia's transport system is sharpening. Rail must be an essential part of that change. Will the 1990s be the Decade of the Train?

*Australian National, a partner in Railways of Australia, has reprinted the Network article in one of its series of information pamphlets entitled "Road Cost Recovery." Copies are available from AN's Corporate Affairs Division, 1 Richmond Road, Keswick, South Australia 5035.*



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(Source: "BN and AMTRAK Vibrate Their Track", Progressive Railroading September 1987).

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# NETWORK

Volume 27, Number 3  
July, August, September 1990



AN Tasrail coal train heads south down the Fingal Valley

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# RETHINKING

**A** REPORT ON INTERSTATE RAIL FREIGHT OPTIONS SAYS A NATIONAL INITIATIVE ON FREIGHT COULD RAISE PRODUCTIVITY AND IMPROVE RELIABILITY AND YIELD, CREATING A PROFITABLE BUSINESS.

**A**n investigation into interstate rail freight operations suggests that a single national organisation would generate valuable economic and social benefits for Australia and could be run at a profit within four years.

In late 1989, following a 12-month study by a team of senior railway executives brought together by the Railways of Australia Committee, the National Freight Initiative (NFI) was established by individual railway Systems, major rail users, including BHP, several major freight forwarders, and the Federal Government. Its mission was to examine the feasibility of a





# G FREIGHT

national freight organisation profitably and competitively performing the interstate rail transport task in Australia.

Consultants Booz-Allen & Hamilton (Australia) and Travers Morgan were retained by the NFI to carry out a joint feasibility study of options for achieving this goal — options for terminals, linehaul arrangements, and capital funding.

Using data supplied by the railways, National Freight Group (NFG) and governments, Booz-Allen and Travers Morgan estimated the size of investment, operating costs and revenues generated by

operational/capital options.

Data on interstate rail and truck origin-destination traffic flows, relative rail and truck cost and service factors, and past shipper surveys were used to evaluate the revenue impacts of the options for building a rail-based interstate freight network. Cost factors developed by Travers Morgan for Railcost (and similar) models were then recalculated for world-standard efficiencies, adjusted for local operating conditions. The consultants reviewed existing railway investment plans to improve the flow of interstate freight, adjusted them, and assigned them to each option.

It was expected that a single national enterprise, properly managed, would be more efficient and competitive than the collection of interstate services now offered by the rail systems. The commercial issue was whether the enterprise, under the best of the options, could earn a commercial return on investment and be viable over the long term. If it could not, would the continued operation of interstate rail services be justified from a public-interest perspective?

The consultants reviewed the market potential for interstate freight. Most of this moves by road or rail, decisions that usually depend on time pressures. Rail, which has the major share of the East-West corridor and much less in the North-South, dominates in less urgent freight such as steel and overseas containers. Primarily moving "next day" or "express" freight, road commands the North-South corridor. On the East-West corridor, it cannot compete with rail on cost.

Interstate rail freight represents less than 20 per cent of national rail revenues. Its strategic importance varies by System, however.

Interstate tonnes and NTKs have increased over time, but, in real terms, revenue growth per NTK has not kept pace.

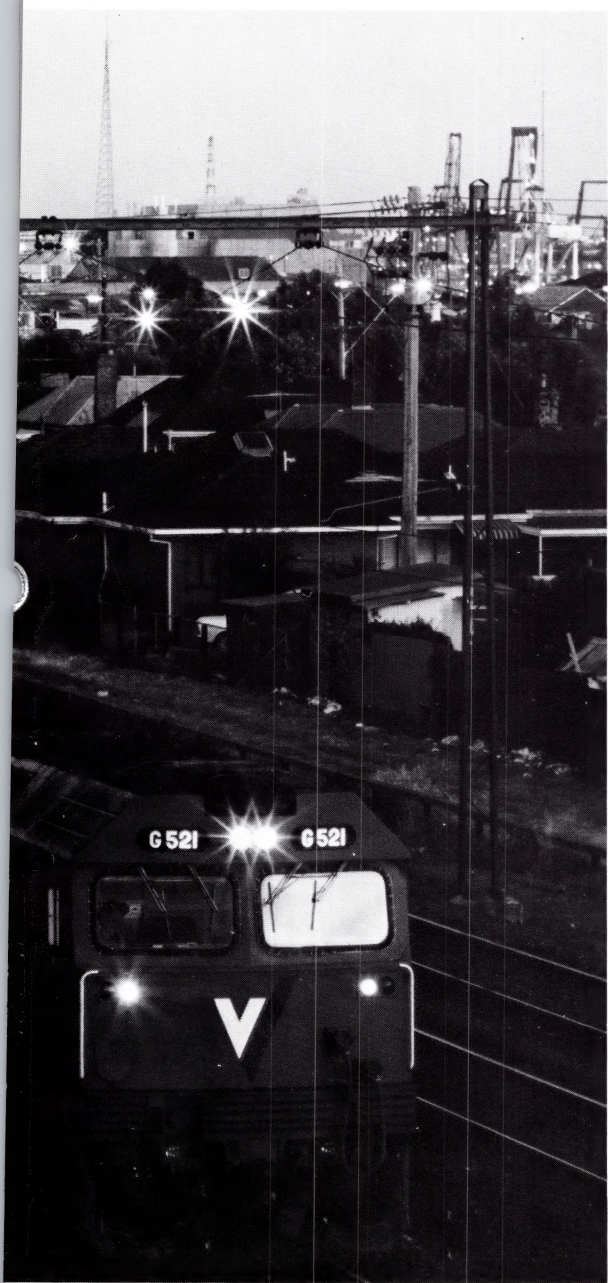
**M**arket studies, rail staff and customers have pointed to reliability as the key issue concerning rail service, and the Booz-Allen & Hamilton survey confirmed this finding. Customers suggested reliability improvements in three areas:

- Improved reliability of scheduled transit time.
- Reduced terminal delays — variations in pick-up and delivery times.
- Faster transit times for certain segments if they could be reliably delivered.

A choice modelling exercise suggested a market share improvement for rail of approximately 10 per cent for improved reliability; not even price was more important.

The report concluded that the rail interstate freight market had potential, and analysed operational

**NIGHT RIDER:**  
**Superfreighter**  
**leaves Melbourne**  
**for Adelaide in the**  
**early evening.**  
**The NFI report**  
**suggests that**  
**minor spending on**  
**infrastructure**  
**would greatly**  
**improve rail freight**  
**flexibility.**





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requirements and market constraints.

Traffic density in all but a few corridors is quite low. This and long distances pose problems in financially justifying forming and maintaining a high-standard transport infrastructure for rail and road transport.

For the roads, this problem has been acknowledged on the interstate routes by the national highways program, a plan pursued with a strategic national approach although many parts of it are hard to justify on strict economic grounds.

Although there have been some investments in the interstate rail network (for example, the standardisation of Albury/Melbourne), there has been no focus on rail infrastructure to match the roads program. Because of the low traffic densities, the history of regulation, and the lack of a national approach to investment priorities, rail Systems were not designed to compete successfully with road transport: track standards limit speeds and axle loads; many lines were built with limited budgets (including standard-gauge Melbourne-Albury and via Broken Hill); and lightweight rail, wider sleeper spacing, small cross-section sleepers, and an absence of sleeper plates all reduce rail's ability to handle larger wagons at higher speeds and increase maintenance costs (through requiring frequent surfacing and earlier replacement). Bridge capacities are also a limiting factor.

Train sizes are limited by short passing loops, relatively weak couplers and drawbars, and short receiving and departure tracks in marshalling yards, and this reduces railways' ability to compete.

Where bogie exchange/transfer is necessary, multiple gauges add cost and service burdens. This is a notable problem on Melbourne to Perth or Alice Springs movements, as it is on potential interstate movements in all states except New South Wales.

To add to this, Australian terminal productivity in general is low. Congestion at Acacia Ridge, Chullora, and Dynon add greatly to service deficiencies. These problems are compounded by some train schedules that take no account of capacity limitations. Nevertheless, some terminals are operating effectively despite large increases in traffic in recent years.

Plans for investment and improvement will help relieve these problems, but Sydney will need to spend a great deal on its terminal to cope with projected business.

The consultants defined a number of key factors for evaluating NFI options.

- **Services and market requirements:** Sustained improvement in reliability; additional market penetration; a new external image, selling a "seamless" service; and incentive performance agreements with service suppliers.
- **Costs:** A zero-based cost structure; new labour agreements (accomplished or committed); critical investments; track rehabilitation and maintenance; and capital improvements evaluated and priorities established on a national system-wide basis.
- **Management:** Normal commercial relationships between business entities; choosing the best

management for the national freight job; and effective national freight management control of its own assets.

## NFI boundaries

**T**he report suggests that NFI should have full marketing and operational responsibility for around 95 per cent of interstate rail freight.

Ownership or lease of rolling stock would provide NFI with the highest degree of control, but running rights would need to be bought from the Systems.

### Track and signalling.

Infrastructure would remain in current ownership.

NFI would purchase running rights, including specific train paths, through performance contracts.

Train control responsibility would remain with Systems for the foreseeable future.

Maintenance standards were critical to maintaining reliability and would require agreement between NFI and the Systems.

### Locomotives and wagons.

It was assumed that the NFI should ultimately own its own locomotives and wagon fleet. (It might also encourage expanded private ownership of wagons, especially new capacity.)

In the short term, it might lease its fleet from the rail Systems.

Swing capacity wagons might be hired from Systems.

The study considered the option of a number of wholly privately owned freight trains being operated by different companies on a common rail infrastructure. Operational problems were found to be formidable, possibly losing many of the economies of rail transport. Annual hire trains are already available from railways for major users; the priority is to operate these and other trains more reliably and at lower cost.

## Operating options

**T**he report defines eight operating options, each with varied levels of capital investment, market shares and operating costs.

Full profitability for interstate freight could be achieved at traffic levels forecast for 1993-94 if:

- All rail projects now planned and under way in the Systems were completed.
- The track was maintained to standard with all speed restrictions eliminated.
- Operating costs were reduced to levels technically achievable, based on overseas and Australian experience under comparable operating conditions.
- Certain high-priority capital projects designed to improve transit times, space availability and overall reliability, primarily in the North-South corridor,



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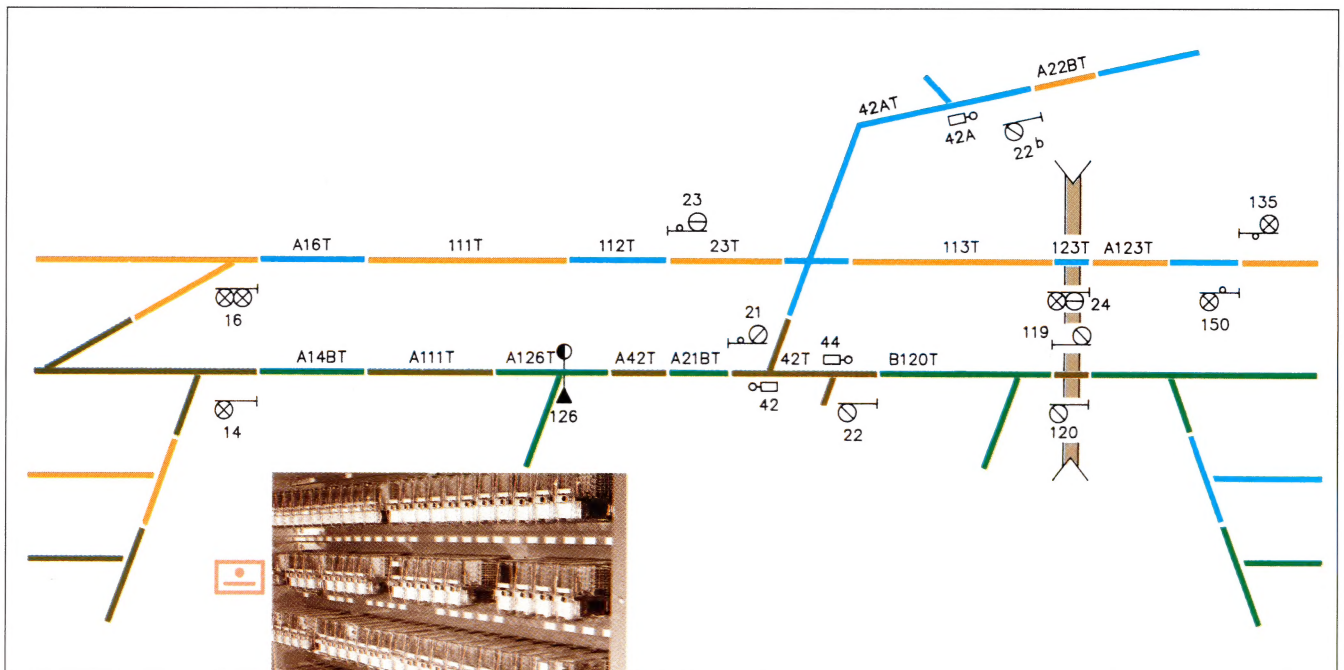
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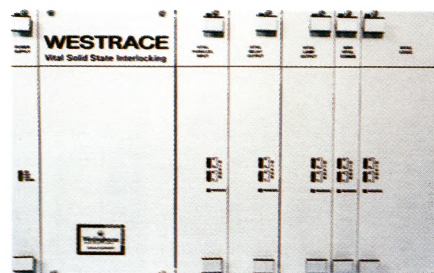
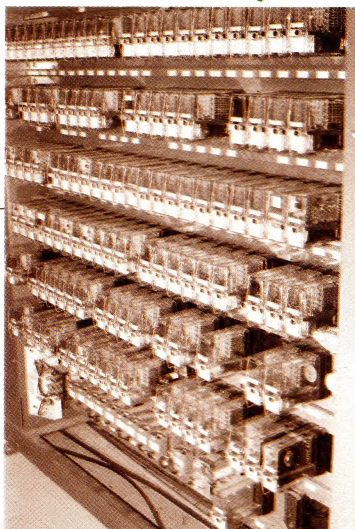
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#### **FREIGHT IN BLACK:**

**AN Freight, AN's mainland freight business segment, has earned surpluses since 1987/88. Piggyback operations (right) offer cost efficiency on the system's services.**

were carried out.

- Selected increases in freight rates were implemented.

The priority investments identified in this option are:

- Vic/SRA Fast Freight Train project (partial) — \$40 million.
- Removing height restrictions — \$6 million.
- North Coast line crossing loop extensions — \$40 million.
- Dynon upgrade — \$22 million.
- Enfield redevelopment (interstate portion) — \$25 million.
- Islington upgrade — \$20 million.
- Long trains and reduced transit (Parkes-Broken Hill) — \$12 million.
- Kewdale upgrade — \$10 million.
- Acacia Ridge upgrade — \$3 million.

Even greater profitability could be achieved if \$250 million were spent on a standard-gauge line from Melbourne to Adelaide, or \$210 million spent to provide a 10-hour transit between Melbourne and Sydney.

A viable NFI requires a combination of cost reductions and selective rate increases and would not critically rely on major investment. As road and rail are competitive, particularly in the North-South corridors, service improvements are a prerequisite for higher rates.

Road rates may increase, but this is uncertain.

- There is pressure in the North-East to decrease road usage. Accidents on the Hume and Pacific Highways have brought public outcries over truck numbers. The political response to these



pressures will most likely result in greater restrictions, and thus higher road costs.

Road freighters have publicly suggested a rate increase may be forthcoming (upwards of 20 per cent), and government road cost recovery objectives may lead to higher road-user charges. Greater enforcement of vehicle driver safety regulations is also predicted. Road productivity will continue to increase, however, with more widespread use of B-doubles and continued improvements in vehicle technology.

In practice, the precise financial outcome depends on a number of factors, including the institutional structure of the National Freight Initiative; the boundaries of NFI; the rate at which non-contributing traffics are discarded; NFI's ability to zero-base costs, including the amounts NFI is cross-charged by individual railways for their services, and NFI's own overhead structure; and the rate of implementation and the scheduling of investment.



# TRACKS

A VIABLE NFI REQUIRES  
REDUCED COSTS  
AND SELECTIVELY  
INCREASED RATES.

## Terminal Options

Interviews with stakeholders and an assessment of key success factors for the NFI identified several important terminal issues.

Customers accurately perceive that terminal congestion and low productivity are major contributors to unsatisfactory interstate rail service.

Major users expressed a willingness to operate terminals to overcome these problems, and might also be willing to provide capital for improvements. This helped to launch the NFI concept.

All rail users expressed serious concerns about only having access to rail services through competitor-managed terminals, and suggested the possibility of a consortium.

Smaller customers, also important to NFI, would be especially reluctant to use rail if access was controlled by major competitors (in a consortium or individually).

An analysis of critical success factors suggests that the NFI must ultimately be able to control its terminals if it is to deliver a competitive and reliable service. At the same time, the benefits of using private sector capital and expertise in developing and operating terminals should be considered.

It was held that no one solution need apply to all terminals as requirements and existing configurations vary. Further study of terminal options is obviously necessary.

## Conclusions

The report concludes that, given improvements in productivity, the achievement of sustained reliability, and an enhanced yield, the NFI could transform interstate freight into a profitable business.

Compared with the current situation, the NFI option could improve the national financial performance of interstate freight by \$339 million a year.

By contrast, without the NFI the long-term viability of the North-South corridor is in doubt. Today it does not even cover operating expenses before capital. Large sections of the railway in this corridor exist primarily for interstate traffic and require major spending in the medium term. State investment priorities do not favour interstate freight.

The assessments indicate that a national initiative is necessary — revolutionary and not evolutionary change is required.

A major thrust to improve productivity is needed across the whole service — the important but piecemeal approaches now planned by the states



are unlikely to yield the cost levels needed in interstate markets within a reasonable time.

Rail's fragmentation has meant that it has not delivered high service reliability despite good intentions. This reliability, achievable only when one body is responsible for its delivery, is a prerequisite both for winning higher value markets and to enhance existing markets.

In turn, yield enhancement calls for sophisticated and selective national pricing strategies, designed to achieve the best traffic mix at the best price. This is difficult to achieve with today's conflicting revenue-sharing interests and differing business strategies between railways.

Scarce capital funds for interstate freight will require pinpoint setting of national commercial priorities to achieve the maximum cost-effectiveness.

The NFI is not an end in itself. It is a means to achieve a nationally viable interstate rail business and to make a vital contribution to microeconomic reform by boosting GDP.

The Industries Assistance Commission has estimated that each \$1 saved in rail deficits through productivity improvements will add \$3.19 to GDP. On this basis, Option C2 would increase GDP by \$863 million annually.





The external benefits of sustaining the interstate rail System are also substantial. It is estimated that Option C2 would provide annual savings of \$215 million in road infrastructure costs, and \$83 million in accident costs.

## An ANFC

**T**he National Freight Initiative committee is now looking at possible institutional frameworks for an interstate rail freight organisation. One structure seen to have considerable potential is an Australian National Freight Corporation (ANFC), where states would take stakes

Under this option, several things would happen.

- Australian National (AN) would be restructured so that its mainland freight service division becomes an Australian National Freight Corporation (ANFC) entity with wider ownership.
- Shares in the ANFC would be bought through assets or cash by the states. ANFC's board membership would be expanded to include other commercially-orientated directors nominated by shareholders.

- ANFC management would take responsibility for all interstate services.
- The ANFC could own its own tracks and be responsible for its own signalling and train control on what is now the AN network. It would pay for running rights on other System's tracks.
- Tasmanian Railways and AN's passenger services would have to be separate companies within the ANFC group and retain full Commonwealth ownership.
- A shareholders' agreement on funding losses would be entered into before profitable operation.

**T**he Booz-Allen/Travers Morgan Report has been well received by the National Freight Initiative committee, initially chaired by Mr K. M. Fitzmaurice from the Public Transport Corporation of Victoria, and now by Mr V. Graham, of the State Rail Authority of New South Wales. Obviously, quite a lot of work remains, but rail now has the incentive to move quickly. State and Federal governments have been briefed on the report, its contracts, challenges, and great potential.

A detailed prospectus is now being prepared. Railways of Australia hope that the tremendous potential for improvement will be realised.

**WESTBOUND FREIGHT:**  
Westrail interstate freighter at Bonnievale between Kalgoorlie and Perth. Seventy-five per cent of east-west freight to Perth goes by rail.





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**Top:** View from a height of about eight metres of stabilisation work on a rock cutting on CityRail's Illawarra South Coast line.  
**Above:** Excavators prepare the base of the Helensburgh slip for slot drains and mass fill behind the gabion wall placed on bedrock.

# CityRail's biggest challenge comes in on time

**C**ityRail has completed work on its Illawarra South Coast railway line after a total shutdown of the line for one month and two months of off-track work between Mortdale and Wollongong City.

Mr. Brian Lanyon, CityRail General Manager, Engineering, says the \$40m project is the largest of its type undertaken in the CityRail network. It was completed on schedule.

"Gaining total possession of the line for one month during the Christmas holidays was a



# TRACKS

major breakthrough for CityRail engineers. The alternative was an extended series of weekend possessions stretching over a two-year period. Some work could not wait.

"The main reason for the project, the five bad slippage areas around Bulli, Stanwell Park, Seabank, Metropolitan Colliery and the Helensburgh tunnels, have been made as safe and stable as technically possible. Three major rock-fall areas at Helensburgh, Stanwell Park and Bald Hill have also been stabilised.

"The work also included the installation of some 19km of concrete sleepers on both tracks between Mortdale and Sutherland and between Helensburgh and Bald Hill Tunnel, and some major culvert and drainage improvements.

"The overhead wiring structures between Loftus and Mortdale have been partially replaced and repaired, as well as a track strengthening programme and major repair work to slip sites, culverts and embankments."

Nine hundred staff and 300 contractors worked in shifts around the clock, seven days a week, at the height of the project.

"CityRail organised a combination of express and all-stations buses to replace rail services in the Christmas holiday period for the 40,000 passengers who travel each way on the Illawarra South Coast line," Mr Lanyon says.

"The whole project has been a huge success. From now on, the Illawarra South Coast line will be giving much more reliable service, letting people plan their journey times with much more confidence."

The Illawarra South Coast project is part of CityRail's \$2 billion five-year investment programme.

The Illawarra South Coast line services commuters between Wollongong and Sydney (South Coast) and commuters living in Sydney's South, through to Sutherland and Cronulla (Illawarra).

It also services the coal and wheat-loading facilities at Port Kembla, as well as the steelworks at Wollongong.

The line, particularly the stretch from Waterfall to Wollongong, has a history of stability problems dating from the last century. Contributing factors include inherent geological instability, frequent heavy rainfall, poor standards of earthworks construction and



**The Helensburgh cutting being stabilised using 300 anchors in holes drilled from above and horizontally rock face. Eroded rock was sealed by blasting concrete the cutting face.**





## Nine hundred staff and 300 contractors worked in shifts around the clock, seven days a week.

repairs to original slips in early years, emergency repair work, and a large number of under-capacity drainage culverts.

The heavier axle loads of modern trains have intensified these problems. Over more than 100 years, considerable effort has gone into dealing with difficulties as they developed.

Investigations of the line by CityRail and by external consultants, including Booz-Allan & Hamilton, confirmed that the Illawarra South Coast line was a priority area for attention.

Five major slippage areas – at Helensburgh, Metropolitan Colliery, Stanwell Park, Seabank, and Bulli – threaten the line. Heavy rainfall in April, May and June 1989 caused further subsidence at these sites, leading to speed restrictions at a number of locations and closure of the track to rectify sites as problems arose. Several locations had to be under 24-hour surveillance for long periods.

In 1989, Booz-Allan & Hamilton recommended speeding up work to improve the engineering infrastructure of the line – track, drainage, overhead wiring and signals. Overhead wiring structures and the wiring itself were reaching the end of their lives and other maintenance and track strengthening activities needed to be done.

To ensure the safety and reliability of the line, the Illawarra closedown project began on 27 December 1989 and lasted 33 days to 29 January 1990. The alternative was to close down the line on weekends for two years. Some work could not wait.

The line was totally shut down over the Christmas holiday period to minimise disruption to commuters. Traditionally, the line carries fewer passengers and less freight at this time, and charter buses are also much easier to obtain.

CityRail organised bus transport for 40,000 passenger journeys each day to and from Illawarra/South Coast during the shutdown. Passengers were encouraged to use private cars by providing extra parking spaces at Moore Park, Sydenham and Wentworth Park. They were also encouraged to use the East Hill line.

The scope of the work can be grasped from these details

### ■ Track strengthening (concrete sleepers)

18km. Both tracks Mortdale-Sutherland, Wollongong-bound track Helensburgh-Bald Hill Tunnel. Required 100,000 tons ballast, 30,000 concrete sleepers and 500 rail welds.

■ **Overhead wiring.** Structures replaced or modified. 17km of wiring independently registered and refurbished. Capacity of system upgraded. Junctions renewed.

■ **Other works.** Resurfacing and general drainage works completed. Other works include replacing 10,000 timber sleepers, cleaning out cess drains, minor earth works and production tamping, and CWR.

■ **Major embankments and cutting restorations.** 5

■ **Culvert enlargements.** 25

■ **Miscellaneous.** Platform alterations, bridge repairs, drainage, scaling down of rock faces, upgrading of signals, rock anchoring of Helensburgh cutting.

### ■ Personnel

CityRail (includes State Rail gangs from Narrabri, Grafton, Dubbo) 900

Contractors, Plant Operators, etc 300

### ■ Equipment

Track machines 40

Locomotives 12

Trucks up to 300

Major plant items up to 200

■ **Working hours.** 10 to 14 per day, two shifts in some areas

The project team for the closedown was headed by Bob Ford and consisted of John Ward, co-ordinator of construction work between Mortdale and Loftus; Andy Addinall, co-ordinator between Loftus and Bald Hill Tunnel; Barry Hedley, co-ordinator between Bald Hill Tunnel and Wollongong.

As scheduled, the Illawarra South Coast line was reopened to normal rail services on 29 January 1990. Some off-track work remained.

The five bad slip areas have been made as safe and stable as technically possible and the three major rock-fall areas at Helensburgh, Stanwell Park and Bald Hill stabilised.

Both passengers and freight will now enjoy a much more reliable service on the Illawarra South Coast line.

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**FUJITSU**



# Goodbye pa

**E**lectronic data interchange (EDI), hailed as the most important technical development in transport since containerisation, offers the transport, shipping and trading industries opportunities — including paperless trading — that will improve processes of documentation and communication which have retarded progress and contributed to rising costs.

What is EDI? EDI links organisations electronically. It is the transmission of standard business documents (such as consignment notes, purchase orders, requests for quotations and invoices) from computer to computer between companies. The information is exchanged in standardised international formats through a "value-added network", which acts as an electronic

mailbox for the companies.

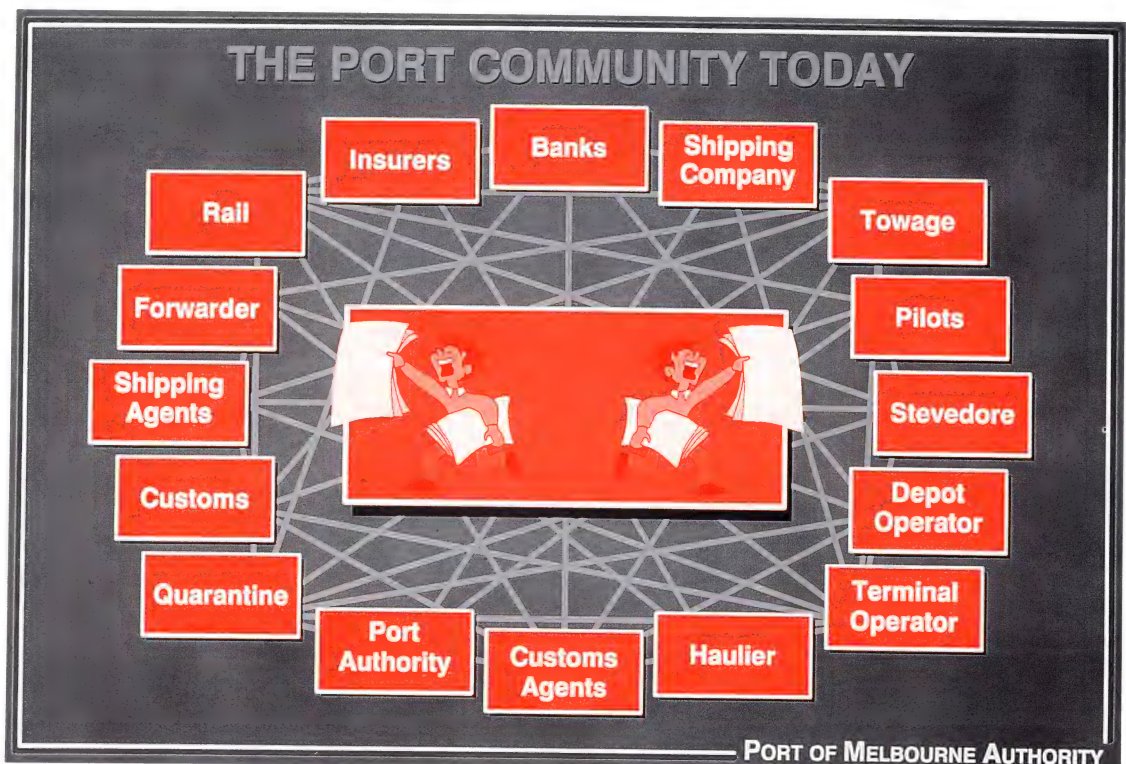
Companies linked by EDI have negotiated legal agreements to formalise their data transfer relationship. Information passing between companies complies with standards for content, format and transmission control mechanisms.

EDI operates through networks provided by specialist computer companies. These "third parties" offer a range of services to smooth inter-company connections for organisations new to EDI or that exchange business information with many organisations.

Two Australian companies providing EDI networks are Paxus Comnet and Tradelink. Paxus Comnet is the EDI provider for the new Tradegate organisation, of which ROA is a founding member. Tradegate was set up to provide an electronic

communications network for Australia's international trade community following the recommendations of the Interstate Commission's "Waterfront Investigation." It is owned by organisations representing industry groups and aims to provide services benefiting its members. Along with the Railways of Australia, founding industry members of Tradegate are the Australian Association of Port and Marine Authorities, Qantas (representing IATA and all Australian airlines), the Customs Agents Federation, the Australian National Maritime Association, the Australian Road Transport Federation, the Australian Forwarders EDI Association, and the Australian Chamber of Commerce.

As part of the Waterfront Investigation, the national communications working party





# erchase

recommended bringing together carriers, ports, terminals, sea, road, air and rail transport and the trading transactions of importers and exporters.

Australia's ports, particularly those handling containerised general cargo, will be drawn into using EDI because of the acceptance of its use by these trading partners.

EDI operates in many ports throughout the world and its use is growing rapidly. Standard messages important for co-ordinated growth of the transport industry — purchase orders, invoices, delivery notes, manifests, bills of lading, forwarding instructions and arrival notices — are still being designed and tested. ROA, as a board member of EDICA, the EDI Council of Australia responsible for these message standards, is taking part in this process.

**T**he Port of Melbourne Authority has recently launched Tradegate Express following a major feasibility study of EDI. It is believed that EDI could save the Victorian transport industry alone at least \$40 million a year in operating costs and many hundreds of millions of dollars more in lower inventory costs.

Tradegate Express aims to reduce documentation within the trade community, provide better, more accurate and more timely information, speed up cargo movements, reduce communication and documentation delays, and cut operational queries.

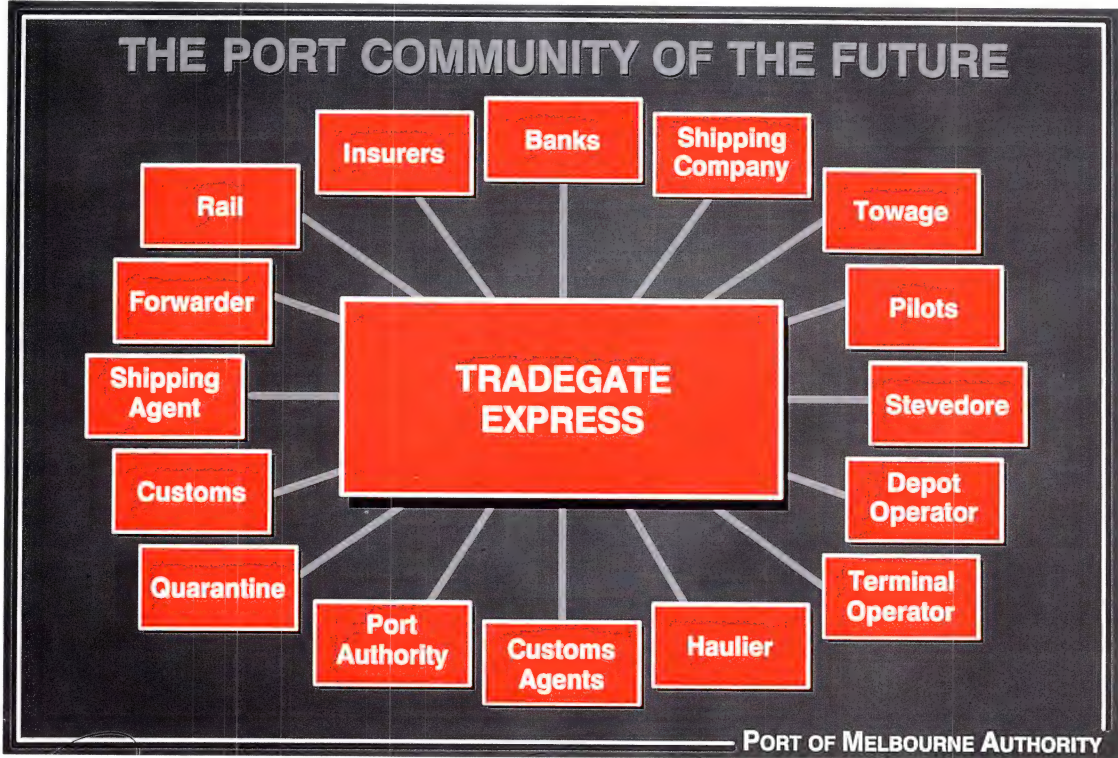
Rail and its customers will benefit greatly from this development. There is also a vast potential for using EDI within internal rail freight movements.

For example, at any given time

an overseas shipping container could be held by a shipping company, a terminal, customs, quarantine, a road haulier or by a rail system. With EDI, the customer will know where and why the container is held, thus pinpointing weak links in the transport chain and exonerating parties not responsible for delays.

Tracking overseas containers is just the beginning of EDI applications for rail. Interstate rail processes 266,000 consignment notes a year carrying information vital to the originating system, the receiving system, and often to a through system.

The information goes to customer service, rail operations, invoicing, and management information and the revenue is apportioned among the five Systems. Clearly an information exchange of this size is an excellent application for EDI.





# TRACKS

EDI offers rail the chance to introduce a national wagon control system providing both systems and customers with up-to-the-minute information on train and wagon movements across Australia. Considering that 90 per cent of the 266,000 consignment notes apply to rail's top 100 customers, companies such as BHP, TNT, Mayne Nickless, Brambles, Linertrains, Ford, and APM, the potential for EDI is obvious.

These customers will be directly linked to rail by EDI with benefits to both parties.

- Rail would benefit by a reduction in paperwork costs.
- Customers would benefit by calling up up-to-date information by container number or consignment note

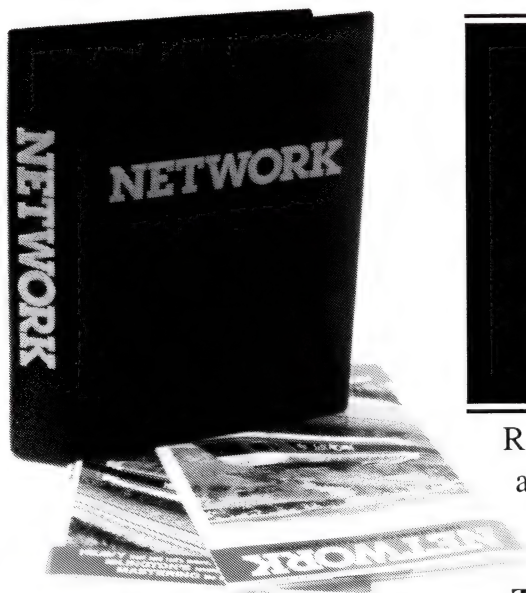
number.

- Both parties would benefit by elimination of clerical mistakes, as information simply flows from computer to computer.
  - Barriers to the free flow of information between participating operators would be removed.
  - Railway Systems would receive information on freight requirements direct from the computers of shippers and customers, making simpler the scheduling of rolling stock.
- Rail is now running two EDI trials. The first links Australian National in Adelaide with Westrail and V/Line, using the Tradelink EDI network marketed by Telecom Plus. The data being exchanged is the equivalent of a shipping manifest. It includes train

numbers, scheduled and actual departure dates, numbers of locomotives, types of goods being carried, consignors, consignees, origins, destinations, wagon numbers, wagon weights, and dates on which wagons are loaded.

The second trial involves Railways of Australia and the State Rail Authority of New South Wales. It is using the network supplied for Tradegate by Paxus Comnet.

EDI Research Australia has concluded that it is most important that Australia understands that EDI is increasingly becoming the language of international trade. Clearly rail has the highest potential gain in both international and domestic freight.



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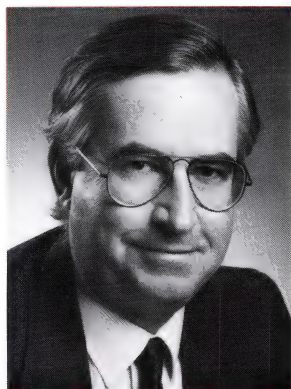
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# THE ESSENTIAL

**T**he 1990s *could be* the decade in which rail reasserts its natural role as Australia's premier medium- and long-distance freight carrier.

There can be no doubt that rail possesses what is intrinsically the most cost-efficient infrastructure for the linehaul of freight. The opportunity to perform a far more significant and relatively cost-effective role is ours; I would like to elaborate on what I regard as the eight imperatives required to be met if we are to grasp this opportunity.



This is a summary of an address by Dr D. G. Williams, Chairman of Australian National, at the Australian Rail Business Conference in Adelaide.

# EIGHT



## THE ESSENTIAL

# 8

They are:

- 1** A concise definition and complete separation of the commercial business from CSOs (Community Service Obligations).
- 2** A simple, explicit and powerful commercial goal.
- 3** Definition of the framework to achieve the commercial corporate goal.
- 4** The need to base pricing on full cost recovery.
- 5** The need to fix railways' commercial balance sheets.
- 6** The creation of a sound corporate culture.
- 7** Adequate funding of CSOs.
- 8** Better co-operation between rail systems.

These are not in any priority order, and there are undoubtedly other important issues.

### THE FIRST IMPERATIVE

**Concise definition and complete separation of the commercial business from Community Service Obligations (CSOs)**

**N**o half measures are tenable. The commercial and CSO business must be treated as completely separate operations with separate corporate goals, separate corporate plans, separate accounts, separate management, separate resources, or, where it is physically impossible, fully accounted transfer costing.

Aggregation of results at any level is dangerous and must be eliminated. No half measures — otherwise you will always carry a self-imposed burden of cross-subsidisation between the CSOs and the commercial business, and this is not (or should not be) the responsibility of rail management.

Any management that takes this upon themselves deserves the fate it will inevitably produce — a

masking, and hence distortion, of the cost-based pricing upon which the commercial business must be based, resulting in a non competitive, second class railway.

### THE SECOND IMPERATIVE

**A simple, explicit and powerful corporate goal**

**H**aving segregated the commercial business from the CSOs, the second imperative is to set a clear (preferably single) commercial corporate goal to drive this business.

There is no choice; it has to be an explicit profit goal. It cannot be a service goal or a productivity goal. These are secondary.

There are many ways of expressing the profit goal. For example, it could be a dollar figure, a return on income, a return on expenditure, or a return on assets employed.

At Australian National, we have reached the conclusion that at our stage of commercial evolution, having achieved break-even, the basic goal now has to be a simple dollar figure for each year. This is \$10m in 1989/90, rising at the rate of \$10m per year *in real terms*. So the goal for 1990/91 is \$20m, the goal for year ten is \$100m.

Anything other than a simple dollar figure lacks meaning for the organisation. Every employee has to understand, and return on assets employed fails this test.

It should be emphasised that the profit figure, to have integrity, must be based on fully comprehensive current commercial accounting practices. And we must expect to pay all commercial taxes. There can be no hidden subsidies, no unaccounted liabilities and only fully funded capital budgets.

On the second imperative, it is worth addressing the question of who sets the goal: the appropriate Minister or, where there is no board, the Commissioner or Chairman in consultation with the appropriate Minister.

The goal must be difficult or appear to be difficult. It is amazing what can be achieved when the challenge is quite explicit.





**AN Superfreighter crossing the outback to Aice Springs. AN's commercial freight business made a real profit, fully and properly commercially accounted, of \$9 million in 1989/90.**

## THE THIRD IMPERATIVE

Definition of the framework to achieve the commercial corporate goal

**S**etting the explicit goal is the easy part. Achieving it is what is hard. Pleasure in a good piece of track, a new loco, a new class of wagon, a train arriving on schedule is fine and keeps us going day to day. But the ultimate satisfaction is in achieving the overall profit objective. Break-even was a powerful goal for Australian National. Now that it has been achieved, an annual profit goal will, we hope, prove to be equally powerful.

I would like to reflect briefly on the unusualness of railways. There are very few businesses that have direct responsibility for so many aspects of their product.

- We make and maintain our track, communications and signalling infrastructure (using a few parts supplied by others).
- We maintain our locomotives.
- We maintain and still make much of our rolling stock.
- We self-regulate our operating and safety standards.

- We specify, market and produce our services.
- We maintain the full range of service support in information, human resources, finance and corporate affairs.

*We are effectively the grower, the wholesaler and the retailer and we make and manage our regulatory practices.*

This illustrates the breadth of the railway task and the complexity of balancing all the aspects we must directly control. The scope for getting it wrong is great; the scope for corrective action is limited.

This highlights the need for long-term vision and for the need to set up a total framework. The Third Imperative calls for a framework which identifies:

- Those variables over which you can exert direct control, and the differing times over which this control can be effected.
- Those variables over which you exert only partial control, and who exerts the rest, and how you therefore seek to influence those variables.
- Those variables over which you exert no control. Here you can only aim to identify and monitor them and be aware of counter actions to ameliorate their impact when they occur. The trick is to see them coming and to react in a controlled way — to avoid overreactions that throw the grander plan out of kilter.

Having identified and assessed these variables, we need to fix goals for those we wholly or partially control so that they collectively achieve the corporate profit goal.



## THE ESSENTIAL

# 8

All this requires long vision (there are no quick fixes) and broad vision (be careful to move everything forward on a broad front; don't let any one aspect fall behind or get too far ahead).

In broad terms, we achieve our goal by increasing revenue and/or reducing expenditure. I would like to discuss aspects of the profit equation.

First, revenue. When I first rejoined railways in 1977, I was confronted by arguments about costing and pricing: fully distributed costs, long-term avoidable costs, direct costs, indirect costs, unit costs, full cost recovery, marginal pricing, what the market will bear, and so on. With some effort, I learned to understand what all these terms meant.

One thing bothered me, however, and that was the prevailing view that railway pricing should be based on long-term avoidable costs. To my simple engineer's mind this did not add up. Yet it was almost a doctrine for some influential people at the time.

I remain of the view that any business that bases its pricing on long-term avoidable costs is doomed. Any comprehensively structured corporate financial model will demonstrate this. Quite obviously, any analysis must produce *both* long term avoidable costs *and* fully distributed costs.

### THE FOURTH IMPERATIVE

#### Pricing based on fully distributed cost recovery

**I**t must be demonstrable that, *in aggregate*, prices are set such that total revenues exceed fully distributed costs. Talk of long-term avoidable costs in isolation is a recipe for commercial oblivion. If it cannot be further demonstrated that the market will bear these prices within a reasonable time, then you'd better shut up shop, or tell your owners that the whole operation is a CSO.

My view is that any traffic that does not have the potential to make a contribution above fully distributed costs within a reasonable period (say five years) should be eliminated. The trick is to withdraw it in a way that does not throw an unacceptable extra fixed-cost burden on the fully commercial traffic.

Having set these criteria, and having set a total revenue goal, the Marketing Manager's exciting task is to identify the mix of traffics and prices that will achieve the volumes, and hence the revenues required to reach the profit targets.

This leads into the service and resource

requirements needed to retain existing traffics and capture new ones, and this is where the operators and the engineers come in.

I would now like to make a few observations about the expenditure side of the revenue/expenditure equation.

I have some concerns about the perennial cry for massive government capital investment, at least on the business we choose to call commercial. If the business won't stand investment at commercial rates then it must either cease or lapse into the CSO category.

I also feel strongly about the need to properly structure capital spending in the context of the annual bottom line. What we spend must be governed by what we earn, or plan to earn within a reasonably short time.

All this I must qualify by saying that I strongly believe that when governments set their railways off on the commercial path, they must start them off on a commercial footing.

### THE FIFTH IMPERATIVE

#### The need to fix railway balance sheets

**G**overnments must be prepared to do two things.

First, to convert sufficient loans to equity to provide a reasonable ratio of debt to equity (and hence a reasonable level of capital charges).

Second, fund their deferred liabilities for such things as superannuation, workers compensation, and annual and long service leave.

Railways cannot be expected to compete with one hand tied behind their backs. However, having fixed these basic commercial factors, I believe the responsibility for funding investment lies squarely with the railway itself.

If the railway cannot provide the required investment from profits or show a commercial return on the investment (not less than 30 per cent in the current commercial climate), then they must behave accordingly. Gradual progress on a firm foundation is the way to proceed. These considerations obviously impact on the debt to equity ratio, and we in Australian National believe debt to equity ratio, like return on assets, is an important secondary corporate goal.

This leads to the next imperative. You may have the



best track, the newest locomotives, the most modern wagons, advanced communications and signalling, and a perfect timetable and still fail to achieve your corporate profit objectives.

## THE SIXTH IMPERATIVE

### The creation of a sound corporate culture

**O**ur success depends on people, people who are proud of the railway, fulfilled in their work, and understand the corporate goal and are thereby motivated to work harder.

We also need people who: understand that we are measured by the reliability of our services, and who consider themselves part of a successful, self-supporting business — *and not employees of a public service activity.*

## THE SEVENTH IMPERATIVE

### Adequate funding of Community Service Obligations

**A**ustralian National's CSOs are all our passenger business, which lost \$37m in 1989/90, and AN Tasrail, which lost \$15m in this period.

Our commercial freight business, by contrast, made a *real* profit of \$9m — fully and properly commercially accounted.

AN Tasrail's corporate plan shows that it will break even and cease to be a CSO in 1995/96. This will not be easy. Between 1977/78 and 1995/96, staff will have reduced from 1686 (825 now) to 550. The traffic task will have increased from 246m NTK in 1977/78 (459m now) to 491m in 1995/96.

This will represent an increase in productivity measured in NTK/employee of 512 per cent. So far it has increased by 270 per cent. This is a measure of what had to be achieved to turn around a neglected, rundown and abused small railway system.

Australian National's passenger services do not have any prospect of breaking even — nor do any long-distance rail passenger services, in my view. Rail's infrastructure costs are such that we will never

be competitive with road and comparison with air travel really has no meaning in Australia. The markets are quite different.

Why then do we carry on with long-distance passenger trains? Because governments consider such services socially and economically necessary. Provided, therefore, that governments are prepared to pay us, *as a revenue*, the cost of the shortfall between earned revenue and fully costed expenditure, why should we argue?

The rub for railways' managements comes in how well we do it — how good a service we can provide with the funds provided under the CSOs. Whether we like it or not, the public perception of our passenger services has an influence on our image quite out of proportion to their relative importance compared with other modes. They are our flagships.

The way we are seen by some of our commercial customers or, more importantly, our potential commercial customers is potentially governed by the poor images of some of our passenger services, images not always justified.

The important point here is that if governments are going to persist with long-distance passenger rail services as CSOs, then railway managements must insist that it be done well. This will not be easy, as most governments (or, more pointedly, most Finance Departments) want the services without paying the full cost.

## THE EIGHTH IMPERATIVE

### Better co-operation between rail systems

**A**ustralian National has a cautious view of the prognosis for a National Freight Corporation. We believe that if it is to succeed then it must be at arm's length from the direct influence of political priorities. Our concern stems from two sources: parochial priorities, which will hamstring the commercial priorities; and the need to ensure that the corporation is not burdened with the losses now being incurred on some routes. We must ensure that any co-operative arrangement is not driven by the lowest common denominator.

Provided these issues are properly covered, then Australian National will be happy to be a party to some form of co-operative venture.





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# Floods bring out Queensland's fighting spirit

**R**

ehabilitation officer Rudy Vander Hoeven was one of many Queensland Railways' staff who worked an 80-hour-plus week in the wake of the devastating April floods in

**Main western line of Queensland Railways in Charleville yard after floodwaters hit the town on 20 April.**





**Railworkers rebuild the line outside the central Queensland town of Alpha, one of the hardest hit of the flooded outback towns.**



central and south-western Queensland.

Rudy and Queensland Railways' occupational health nurse Jay Murray were probably the last people to cross the Belyando River near the central Queensland town of Alpha on 18 April before the great floods struck. They had been on a routine visit to Queensland Railways' personnel in Alpha.

Rudy got back to Alpha, a railway town particularly hard hit, as soon as he could to help in a massive rehabilitation programme. His base was the town's hospital.

"It was a case of offering to help everyone, not just railway personnel," said Rudy.

"My role was to provide emotional support to people who had lost almost everything – families with no accommodation, no food, no power and no water."

The victims were in emotional shock as they struggled to accept what had happened. But their wry humour was irrepressible: "Great top dressing for the lawn, eh," said one victim who had lost everything but the ability to smile.

Often, however, this fighting spirit could not mask the enormous stress placed on people who had suffered devastating losses and faced major decisions such as whether to leave their town.

"We'll need a co-ordinated programme lasting many months

to re-establish the lives of people affected by the flood," said Rudy. He describes his job of counselling on work-related and other problems as "very satisfying from a personal point of view".

Rudy Vander Hoeven was one of many Queensland Railways' employees involved in flood relief. At the height of the flood repair work, Queensland Railways had more than 250 staff in the Central Division alone in the field repairing tracks, buildings and services.

Apart from the flood damage, repair teams had to contend with lack of accommodation, food and water supplies, and the threat of disease. Most supplies and materials were brought by rail from Rockhampton.

**T**he damage bill to Queensland Railways in central and south-western Queensland is conservatively estimated at almost \$8 million, including revenue lost from cancelled service.

Flood waters first cut the main Central line on the evening of 18 April, when the east-bound Midlander passenger train was stranded at Longreach. Then it was found that flood waters covered some 150km of track between Drummond and Winton and on the Yaraka branch line.

At least 30 Queensland Railways' houses were severely damaged by flood waters. Engine

driver Bob Maguire and his wife, Shirley, based at Alpha, had to move all their possessions on to the front lawn. The floor of the Maguire house was a carpet of mud and the waterline reached three metres in some parts of their house.

QR rollingstock was badly affected, with more than 30 wagons damaged in Alpha. Although the rail line to Alpha was restored for limited traffic by 26 April, it was not possible to resume services to Yaraka until 9 May. Traffic resumed to Longreach on 3 May and to Winton on 5 May.

In the south-west, the flood was particularly severe in the Charleville region, with major damage to Queensland Railways' track, rollingstock and housing. The homes of almost all rail staff in Charleville were damaged, with washouts of up to five metres under houses.

Four diesel locomotives and 67 wagons (mainly ballast) and a van were damaged in Charleville yard, from where it was impossible to remove rollingstock.

Charleville station, one of the highest points in the town, became the focus for community relief operations. Services west of Charleville (at reduced speed) took until the end of May to be restored to Cunnamulla and Quilpie because of the huge washouts.





## **TRACKS**

# **AN SHRINKS THE OUTBACK**

HARD WORK AND INGENUITY  
HAS CUT 76 HOURS OFF  
THE ADELAIDE-ALICE SPRINGS  
SERVICE IN JUST 10 YEARS.

**O**nly 10 years ago, it took more than 100 hours for freight and passenger trains to get from Adelaide to Alice Springs — and that was if all went well.

Floods could strand trains in the middle of nowhere for weeks. While the experience became an unforgettable memory for travellers, the delayed arrival of freight in the north caused all sorts of problems for businesses and residents.

That was only a decade ago. Today trains get from Adelaide to Alice Springs in 24 hours or less.

Australian National has good reason to be proud of this reduction in transit time and

continues to work towards achieving a regular service that crosses half the continent in less than 24 hours.

Reducing transit times while improving service reliability are key issues for both freight and passenger services. The Adelaide-Alice Springs rail link is still as vital a landbridge for all commodities going to the Northern Territory as it was a decade ago when the road link was no more than a track in places. Rail, although slow and sometimes unreliable, was really the only option for businesses that wanted to move freight from Adelaide north.

When the last piece of road between Adelaide and Alice



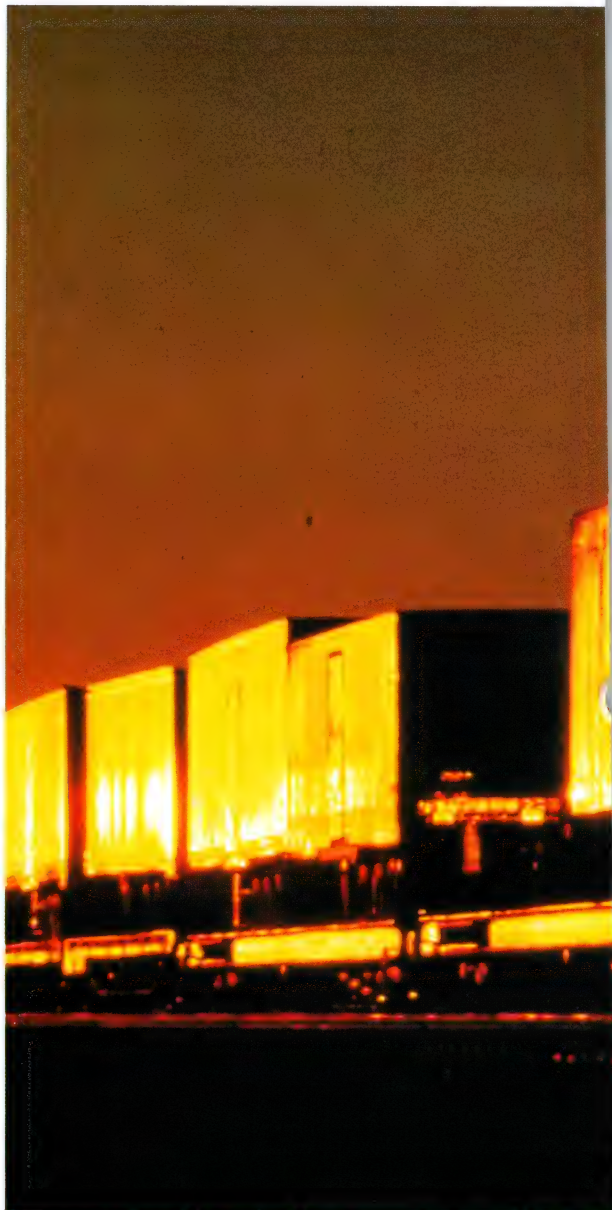
# TRACKS

The setting sun gives Australian National's piggypacks a golden glow as they head north across the outback. The Adelaide-Alice Springs rail is still as vital a landbridge for the Northern Territory as it was when the road was no more than a track.



**Above:**  
Collecting the train order on the Alice Springs line. When Austrac, AN's advanced train control system, is commissioned, trains will no longer stop to collect orders.

**Right:** The introduction of piggypackers and American piggypack wagons greatly reduced loading times.







ht: Superfreighter  
7 approaches The  
outside Alice  
ings at dusk, less  
n 24 hours after  
ving the Islington  
ight Centre in  
elaide.





## **THE INTRODUCTION OF AUSTRAC WILL GREATLY IMPROVE THE FLEXIBILITY OF OPERATIONS**

Springs was finally sealed in March 1987, road competition became a real threat to AN. But AN had anticipated the challenge and done a great deal in its quest for faster transit times.

The first major improvement came with the opening in October 1980 of the Tarcoola-Alice Springs standard-gauge line. This track, with concrete sleepers, was designed and built for high performance. Up to then, northbound trains ran on broad-gauge track from Adelaide to Port Pirie, where there was a bogie exchange on to standard gauge. At Marree, there was another change because the track between Marree and Alice Springs was narrow gauge.

Breaks of gauge were always time-consuming and costly barriers. Manually moving the freight carried on an incoming train at Marree to another train on narrow-gauge track was slow and tedious. The opening of the standard-gauge all-weather link that bypassed Marree shortened transit time by about two days, and there were no more total line closures because of floods.

The standardising of the line between Adelaide and Crystal Brook in 1984 meant that exchanging bogies or transshipping at Port Pirie was no longer needed. Transit time was shaved to 38 hours.

Thirty-eight hours was still far too long, however, when road transport could cover the distance in just over half this time. AN began to look for other ways of reducing transit and delivery times. This was to be a challenging task, one that involved ingenuity and involvement from almost every branch within AN.

**O**ne factor to be considered was the door-to-door advantage that road transport has over rail. The completion of intermodal yards in

both Adelaide and Alice Springs in 1985, and the introduction of more sophisticated piggybacker handling equipment and secondhand custom-built piggyback wagons from North America, immensely improved loading and unloading facilities and reduced the time and cost involved for AN's customers as well as AN.

Just as important as eliminating delays within the terminals was to cut down the time trains took between terminals. The obvious way of getting trains from Adelaide in less time was to make them run faster. But this was no simple matter. The wagons used had to be capable of greater speeds and a good deal of work needed to be done to upgrade the track.

The rail between Tarcoola and Adelaide is 47kg/m rail, but about 100km has only 40kg/m rail. Sections of this track are being rerailed with heavier rail as it becomes available from lines that have closed. Replacing all the track with new heavy rail is too expensive to contemplate. The alternative is to minimise and repair rail damage. AN's railgrinder removes the corrugations in rail caused by heavy loads or fast-moving trains. Once the rail has been ground, and provided the other track components are in good condition, speed restrictions can be removed.

The installation of constant-contact sidebearers into bogies is the most recent major project. Ordinary bogies without sidebearers can run safely at a maximum of 80km/h. Wagons with bogies fitted with sidebearers can run at up to 100km/h.

The sidebearer program for the Alice Springs corridor is almost complete and has accounted for another four-hour reduction in total transit time — to 24 hours.

AN operations branch staff have done their bit to help get trains moving faster. Careful

planning and co-ordination of movements through Port Augusta has resulted in trains spending less time staging through the city. Only essential shunting takes place, and the only wagons removed are those train examiners believe need urgent repairs. A multi-branch project team, under the Alice Springs area manager, has managed to reduce servicing delays.

Some wagons carry cattle. Close consultation with the Cattlemen's Association has enabled AN to transport cattle wagons on normal services. In the past, separate cattle trains were run, partly because of the time it took to load cattle. Ending separate cattle services has cut AN's train costs by 20 per cent and also enabled AN to give the cattle industry more reliable and more frequent services.

**A** noteworthy feature of the Alice Springs service is the immediate turnaround. The locomotive turnaround of about 90 minutes is the best in AN. When it was begun in October 1988, it effectively added about three locomotives to the standard-gauge fleet and reduced the impact of locomotive shortages on other services.

Although a 24-hour transit time is competitive with road, AN is continuing to work to improve its services. The introduction of Austrac will mean no delays to set switches and no stops to pick up new train orders, and will greatly improve the flexibility of operations in the busy Port Augusta-Tarcoola section.

The introduction of commercial RoadRailer operations early in the 1990/91 financial year will mark yet another turning point for the Alice Springs corridor. Roadrailers offer several advantages to both AN and AN's customers and are ideally suited for the long Adelaide to Darwin haul.



# GAUGES GAUGES GAUGES GAUGES GAUGES GAUGES GAUGES GAUGES

The history of track gauges is a saga of human ambition, error, stupidity, fear — and of lost opportunity.

**M**ost people believe that there is only one “gauge” standard on a railway, for we all think of railways as being broad, standard, medium, or narrow gauge. There are in fact three standards to which the term “gauge” applies, each vital to the safe and efficient functioning of the railway. With today’s premium on container and piggyback (trailer on flat car) freight, and on maximising suburban line capacity, each “gauge” also has vital commercial and social implications. The three “gauges” are:

- The track gauge and its derivatives, the back-to-back dimensions of wheel sets and check rails at points and crossings.
- The rolling stock gauge (or maximum

moving dimensions), from which are derived the static and dynamic car envelopes.

- The structure gauge, also loosely known as the clearance gauge.

All three are to some degree interdependent; on narrow-gauge tracks excessively wide cars will tip over and excessively high ones blow over, but, as we shall see, to a lesser extent than people imagine. Trains must also pass through tunnels without scraping things — which, as we shall see, they have done — or, if the windows are open, without removing the head of foolish passengers who ignore the by-laws. But, within limits, there has always been a large degree of freedom of choice in all three kinds of “gauge”, and it is this freedom that we will examine.







**Left: Laying concrete sleepers for narrow-gauge track on a new deviation near Gympie in Queensland. The colony chose 3ft 6in (1067mm) in 1863 and opened on it in 1867.**

**Below: The last broad-gauge passenger train (left) at Gladstone, SA. In the centre are standard-gauge wagons and on the right is a narrow-gauge train.**

**TRACK GAUGE.** With freedom there comes licence, and there is no greater monument to the stupidity of some railway engineers in the past than their teaming up with politicians to create not three but at least *twenty-four* different track gauges for regular commercial use. Several gauges have come into use for the most trivial reasons. At least one was created by an engineer's error, another by adding up and dividing by three. Of the remainder, many were created by the human weaknesses of stupidity, xenophobia, and bloody-mindedness in engineers, soldiers, politicians, and officials.

The track gauge is the distance between the inside faces of the rails, measured (normally) 16mm ( $\frac{5}{8}$ in) below the top or running surface and parallel to the sleepers. It is *not* the distance between the rail centrelines. This error is reputed to have been the cause of the Italian medium-gauge standard of 950mm, that is, the international metre gauge standard, but wrongly interpreted as centrelines between 50mm wide rail-heads.

The list printed with this article has all the railway gauges (correctly measured) known to





have been in commercial use, from 2140mm down to zero; gauges in brackets are no longer used anywhere. Countries printed in **bold face** have adopted that gauge as one of their standards.

With tongue in cheek, we have also listed the smallest track gauge — zero. But what was the largest?

If we ignore proposals for locomotive-drawn ship-cradles, such as the Nicaragua shipway alternative to the Panama Canal, the most credible claimant is the 3.0m (9ft 10in) chosen for a high-capacity, high-speed electric project to run from the Donetz Basin coalfields in the Ukraine region to the USSR and from the Balkans and Vienna to Paris, via Berlin and the industrial heartland of Nazi Germany.

Obedying Hitler's orders, and working under the direction of Dr Wiens between 1940 and 1944, a team of the Reichsbahn's best engineers diverted much-needed wartime resources to designing and running component tests for a giant-sized superrailway. Electrified at 50kV 50Hz, it was to operate trains 5.4m (17ft 8in) wide and 6.85m (22ft 6in) high. These were the body dimensions of double-deck cars and electric locomotives, high-ceilinged ships on rails for passengers, with double-deck engine rooms in the traction units.

Locomotives with a maximum mass of 375t for 16,000kW, and operating in multiple unit, were to pull 1000t passenger trains at 250km/h, and 10,000t freight trains at 100km/h. Electric railcar sets (eight cars for 29,000kW) of similar cross-section were to have double bogies and electric braking for a 3km stopping distance from 250km/h. Contrary to some opinions, this project was taken seriously. Happily for humanity, other events intervened, but the problems of wheel/rail contact stresses with 35t axleloads at 250km/h would have been interesting, since today's superspeed TGV lines in France operate at half this figure. Given what we now know about railway technology, however, nothing else in the scheme seems to have been impossible.

If the Reichsbahn's supertrain was to be a great step forward it could justify its super-gauge. But how can one explain the previous muddle?

**ROMAN RUTWAYS.** In the 1830s, the north of England was served by railways built under George Stephenson's inspiration and already starting to form networks. Their gauge can be traced back to the horse-drawn

colliery tramways and from there, it is claimed, back to the paved rutways of ancient Rome; it is still today's standard gauge of 1435mm.

In southern England, Isambard Kingdom Brunel set his sights on greater stability and higher speed for the Great Western, choosing 7ft for his wheels and a quarter-inch lateral clearance: 7ft 0¼in (or 2140mm) between the rails. He achieved both, but only until 1892.

In 1836, a little-known horse-worked slate tramway had been built in Wales by James Spooner. It ran between the slate quarries at Blaenau Festiniog and the coast at Portmadoc with a gauge of (nominally) 2ft or 600mm; the cars were coupled and, on a superbly aligned steady 1 in 90 grade, descended by gravity and were horse-drawn back up the hill. Nobody took any notice until 1863 when Spooner's son Charles built two tiny 0-4-0 steam engines to replace the horses and pulled 60 empties up the hill. Here were engines that really worked, engines still running today on this "Great Little Train of Wales" for tourist traffic.

Suddenly, there was a real alternative to standard gauge. In the next decade, a host of narrow/medium gauge projects arose. All of them sought to lower construction costs, and most of them confused the key issues: curvature dictated by gauge, and construction standards.

In the last century, and right up to the building of the great transalpine main lines, it was generally accepted that the minimum radius of curvature was about 100 times the track gauge. Below this figure exceptionally high rolling resistances and heavy wear would result from axle-winding and internal slip effects (something which has never worried street railways all that much).

At the turn of the century, the Nilagiri mountain line in India and the Rhaetian Railways' famous Bernina line in Switzerland, both metre gauge, were built to exactly 100m minimum radius curves. Before this the Gotthard line in Switzerland, 1435mm standard gauge (opened under steam in 1882), had used 300m radius — more than double the accepted "100 times" minimum.

The old New South Wales Government Railways' Blue Mountains line had accepted, despite a constrictive ridge alignment, nothing sharper than 12 chains, 241m or 168 times the standard gauge. Only the worst New South Wales Government Railway branch line had five chain radii — 70 times gauge. Most branches used eight chains (161m or just over



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the 100 times rule).

Now sharp curvature enables close contouring of hills, and this massively decreases earthworks and bridging costs. The narrow gauge permitted this, and from 1863 there was proof positive that steam engines could pull the trains. Queensland chose 3ft 6in (1067mm) in 1863 and opened on it in 1867 in a determined attempt to build pioneer lines across the Great Dividing Range to the unsettled plains beyond. The attempt, the world's first, was astonishingly successful: two-and-a-half to three times as much rail could be provided on the same budget as contemporary New South Wales (which, it must be pointed out, included the Blue Mountains and the Main South).

Under Sir Julius Vogel's great public works-driven settlement program of 1870, New Zealand, which until then had only two short provincial standard-gauge lines (one abandoned) and one 1600mm broad gauge system, did the same. So did South Africa from 1873, in order to build quickly from Cape Town to the Kimberley diamond fields.

In 1871, the Denver and Rio Grande opened

for business on the 3ft (914mm) gauge, with 300ft or 91.4m radius curves. British India planned to do the same, but, intending to metricate, settled on the metre gauge to feed its costly broad-gauge trunk lines. It had already used 1067mm in 1865-1868. Continental Europeans bought the idea of the metric system; the tidy numbers were attractive to many. East Africa was issued with secondhand Indian engines and was metre gauge.

**NO LOGIC.** There was, therefore, a credible rationale for the 2ft, standard and a something-in-between gauge on cost grounds. But there was no sound logic for earlier decisions justifying Braithwaite's 5ft (1524mm) on the Eastern Counties Railway in England and the Czar's choice of it. (He had hired Braithwaite and feared invasion on the 1435mm. As Stalin did later, he sadly underestimated the reconstruction capabilities of the Military Railway service of the German Army.) Anyhow, Russia and later Finland contracted Braithwaite's disease. So did the US Erie and the old south. And so did Mongolia a

**Wide-angle view of the Gladstone yard showing the complicated switchwork in the foreground and, from left, broad, standard and narrow-gauge tracks.**





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**QUEENSLAND  
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BUDGET**

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century later, with Stalin as the carrier and China pushing up from the south on standard gauge.

The Irish 1600mm gauge arose from the arithmetic of desperation. It was the average in a dispute between 4ft 8½ inches, 5ft and 5ft 6 inches proposals finally settled by a committee. New South Wales had an Irish engineer, caught 1600mm fever from him, and passed it on to Victoria and South Australia.

Then New South Wales sacked the Irishman and hired a Scot. He switched to standard gauge — leaving Victoria, waiting for its order of engines from England, in the lurch. Melbourne refused to change; Adelaide stuck with Melbourne. Tasmania and New Zealand contracted 1600mm from Victoria, but switched to 1067mm. South Australia remains substantially infected, although Australian National are working on that.

The 5ft 6in (1676mm) gauge seems to stem from the old Indian Army's fears of their trains being blown over, although there is no record of a standard-gauge train capsize at the time. The colonies convinced the Viceroy, Dalhousie, who had been in charge of railways at the Board of Trade and was all for a standard, and pressed for 1676mm. It was chosen, and the first company railway opened in 1853. Iberia and Argentina followed, and by 1880 the gauge situation in the "standard" range was a mess.

It was the same in the "medium" range, with 914mm, metre and 1067mm, and each group of engineers spreading their own True Faith. But worse was to follow. The Italians misread the specification, creating their gauge of 950mm, 50mm too narrow. It is still in use on the Vesuvius circumferential line and in the ex-Italian colonies.

Then the Turks (perhaps egged on by the Germans in fear of Franco-British metre gauge imports?) pressed 50mm too wide; the Arabian 1050mm is also still with us, although increasingly irrelevant as the Arabs standardise.

The origin of the Swedish 2ft 11in (891mm) is totally obscure — a misreading of the ruler in the dim light of the northern winter, perhaps? The Irish 3ft (914mm) was imposed by the British government on the basis of Isle of Man experience.

**ARMY COUP.** In 1873, the Indian Army struck once again: It claimed that the thriving 2ft was too narrow and the metre gauge too wide. This was proved wrong when metre-

gauge trains resupplied the army through waist-deep torrents in a shingle creek bed in Baluchistan during the Afghan war in 1876. But by then they had pressed a military standard of 2ft 6in (762mm) on India. Cyprus and Britain also specified it, as did many other European systems.

Then came World War One. The Germans, Austrians and French had found 600mm fine and standardised on it; once again, the British General Staff was caught with its riding breeches down. In 1915, it hastily ordered 600mm equipment, most of it from America, "in order to use the enemy's tramways when their trenches are overrun" (another tragic piece of optimism). It used its 762mm military equipment, mostly from India, in Allenby's successful campaign in Palestine. By then T.E. Lawrence had blown up all the militarily relevant parts of the 1050mm, anyway.

Meanwhile, continental engineers building industrial lines found 762mm a rather messy figure and introduced 750mm, which was nobody's "standard" but looked tidier.

The proliferation of what the French call "metric" gauges (914 to 1067mm) was encouraged by a confusion between choosing narrow gauge and choosing light construction standards. The two went together in the early days because narrow gauge meant sharp curves and low civil works costs. For no good reason, a standard/wide-gauge line usually meant a quasi-European railway with not only more earthworks but heavy bullhead or flat-bottom rail in the 35-40kg/m class. The exceptions are rare. In India, the Oudh and Rokikund railway was built on Dalhousie's broad gauge, but down to 8t axleloads with 20kg/m rail-metre gauge standards on broad gauge track, with light 0-6-0 engines and through-worked 2 axle freight cars.

The equipment was English but the inspiration American; from the earliest days, the Eastern US railroads had nailed light wrought-iron rail on to timber ties and operated much the same light axle loads on standard-gauge track. As the US and its railroads grew, so did their axle loads: up to 80,000 lb (or 36.3t) plus hammer-blow from the final generation of steam trains, and calling for 77kg/m rail (the world's heaviest). But the standard gauge was held. It was the Civil War (where the South was always desperately short of iron and engines) and business and not government direction that forced the American non-standard 1524, 1676, 1740 and 1829mm gauges to give way to the standard gauge.



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**ON TO MEXICO.** The US narrow gauge never really consolidated its position outside Colorado; in 1942, 64 per cent of the 2250km narrow gauge left in the US was in that state, even though an early aim of the promoters had been to build on the narrow gauge right through to Mexico City. The very light constructional standards did indeed permit a link. But with cars only half the length and two-thirds the width of those finally achieved on the medium gauges elsewhere in the world, US narrow gauge simply could not compete with standard-gauge lines. Then the mines gave out, and the roads improved. The railroads perished except for some spectacular museum or tourist lines.

There is no practical advantage between the standard and the three broad gauges save one: a broader gauge permits a bigger electric traction motor between the wheels. This capacity has been used only by electric locomotives, for example, those built for Victoria, Brazil, India, and Spain by English Electric some 30 years ago. But the basic motor was the "minimum" broad gauge motor: for the Victorian and Brazilian 1600mm. The Russians are believed to use their marginally-broad gauge to its full limit on some electric locomotives, but not on all of their diesel-electrics, at least some of which have 1435mm gauge traction motors, and the extra benefits for them are nil.

Only in India are there suburban electric cars built to the maximum car width potential of the broad gauge (12ft or 3.65m), with "three plus three" across seating. Everywhere else, broad-gauge passenger and freight cars are no wider than the widest comparable standard gauge cars: 3.05m. The only "benefits" of the broader gauges go not to the railways but to the suppliers of axles, bogie frames, and sleepers, who sell more material. Most manufacturers would prefer to standardise, and some decline to quote.

There is no practical advantage in a wider gauge than metre. Metre gauge cars have been run (as on French colonial systems) as wide as those on the Australian standard gauge. While some 1067mm electric locomotives have maximum-capacity traction motors exploiting the useful 67mm difference, all the diesel-electrics and most electric multiple units have the manufacturer's standard metre-gauge motors. However, since 1067mm got in first, and the British are originally to blame for the metre gauge, we can regret that 1067mm was not made the "medium" gauge

standard — and that without being accused of too much bias towards Queensland.

**HEAVY WORK.** Of the sub-medium gauges, by far the heaviest work is done on the original 600mm gauge (on the cane trams in Queensland and elsewhere). Once again, there has never been a technical case for having any other gauge in the 381-762mm range. With steam, diesel and electric, nothing practical has been done on any of them that has not been done better on 600mm. This includes speed; the Festiniog had substantial chaired 25kg/m bull head track and bogie steam locomotives (Double Fairlie types) that ran at up to 56km/h. So there we have it: three justifiable gauges, and all of them rooted in significant technical developments as far back as 1825, 1836 and 1863 — three gauges that could have done the work of 24. Our forebears' record is not good.

The present generation's form is no better. In the 1970s, the San Francisco BART chose 1676mm instead of standard gauge for a new subway system. The reason: so that the trains were more stable and wouldn't blow over. It was a last hurrah for the old Indian Army and Viceroy Dalhousie of 120 years earlier. It was even conceivable that Bombay could have sold them a more substantial and reliable train. But then Bombay was wired on the international standard voltage of 1500 Vdc. BART chose a non-standard 1000 Vdc, just for the hell of it. The equipment didn't work. It also chose a new signal track circuit voltage; the signals didn't work either.

Gauge standardisation in Australia from 1930 (Brisbane link) to 1982 (Adelaide) has eliminated the worst nonsenses where gauge interrupts traffic flows. The exception is, of course, the Melbourne-Perth link. Here Australian National's automated bogie exchange facility at Dry Creek — where the consultants got it superbly right — has reduced delays and costs to a minimum. It will be interesting to see how far private ownership of the new RoadRailers develops, and freight is trucked by forwarders from Melbourne to Adelaide (instead of being routed in wagons and bogie-exchanged at Dry Creek) for RoadRailing across the Nullarbor.

And gauge standardisation of the Melbourne-Adelaide link? All railwaymen and many key shippers can't wait for this final link in standardisation to put all the intersystem traffic of consequence on standard gauge. The noises are promising. In tandem with this,



# RAILWAY GAUGES USED THROUGHOUT THE WORLD

IMPERIAL	METRIC	USED IN
7ft 0¼in)	(2140mm)	(UK — Brunei Old Great Western Railway)
6ft 4¾in	(1945mm)	Netherlands — Old Dutch State Railway 1839-1855
(6ft)	(1829mm)	(USA — old Erie, Oregon, some Southern lines)
(5ft 8½in)	(1740mm)	(USA — Gulala R, CA)
5ft 6in	1676mm	<b>India, Pakistan, Bangladesh, Sri Lanka, Spain, Portugal, Argentina</b> (some old US lines), modern <u>Bart system</u> in San Francisco, Chile
5ft 3in	1600mm	Australia — <b>V/Line and AN, Ireland, Brazil</b> (Tasmania and New Zealand — in early days)
5ft	1524mm	(UK — Braithwaite's Eastern Counties Railway), <b>USSR, Finland, Mongolia</b> , (Manchuria), (old USA)
4ft 10⅞in	1495mm	Toronto, Canada including the subway
<b>4ft 8½in Standard Gauge</b>	<b>1435mm</b>	<b>Standard Gauge. UK, Western Europe, USA, Canada, Mexico, Australia — V/Line, SRA-NSW, AN, Westrail, QR — Interstate, Argentina, Spain, Turkey, Iran, Iraq, Saudi Arabia, Syria, Peru, Uruguay, Paraguay, both Koreas, China, Japan (Shinkansen), Egypt, Algeria, Morocco, Tunisia, New Zealand (early days), South Africa (early days)</b>
4ft	1219mm	(Scotland) Glasgow Underground, (Wales — mines), Spain
<b>3ft 6in Cape Gauge</b>	<b>1067 mm</b>	Southern Africa: <b>South Africa, Botswana, Zimbabwe, Zambia, Angola, Mozambique, Malawi</b> (formerly Nyasaland), Tanzania (Tazara link), <b>Nigeria, Sudan, Ghana, Philippines, Japan — main JR system, Taiwan, Indonesia, Ecuador, Canada, Sweden, Norway, (UK mine lines), Australia — Queensland, AN, esp. Tasrail, Westrail, Victoria — Bellarine Peninsula, NSW — Lithgow Zig Zag, (NT — old North Australia and old Ghan Lines), (India 1865-68)</b>
<b>3ft 5¼in Arabian Gauge</b>	1050mm	Algeria, <b>Syria, Lebanon, Jordan</b> , (Saudi Arabia pre-1917), Dahomey. Known as the Arabian gauge.
<b>3ft 3¾in Metre Gauge</b>	<b>1000mm</b>	<b>India, Pakistan, Bangladesh, Myanmar (formerly Burma), Malaysia incl. Borneo, Thailand, Cambodia, Vietnam, China (Kunming-Hanoi link), many secondary lines in Europe, Bolivia, Ecuador, Chile, Argentina, Brazil, East Africa — Kenya, Uganda, Tanganyika, Ethiopia, Malagasy</b>
3ft 1¾in	950mm	Italy — secondary lines, <b>Libya</b> (closed), <b>Eritrea</b>
3ft	914mm	USA — Old narrow gauge systems mainly Colorado, Mexico, <b>Central America, Columbia</b> , Peru, (Ireland), UK — Isle of Man, (Newfoundland, since closed; White Pass still open)
2ft 11in	891mm	Sweden
2ft 7½in	800mm	Snowdon Mountain Railway (Wales), Pilatus (Switzerland) — both rack railways.
2ft 6in	762 mm	<b>India, Pakistan, Sri Lanka, USA, W. Europe, (Cyprus), UK — minor lines (mostly closed), Australia — 4 feeder lines in Victoria (only Puffing Billy remains), Argentina — Rio Turbio, (some British and Indian Military lines pre-1920), China, Taiwan, Japan</b>
2ft 5½in	750mm	Spain, Minor narrow-gauge lines in Africa and South America, Argentina (Rio Turbio).
2ft 4in	712mm	UK
2ft 3in	686mm	Wales — Talyllyn
<b>2ft and 1ft 11½in Narrow Gauge</b>	600mm (nominal)	Wales, India, Pakistan, USA-Maine, Queensland Sugar Cane, Fiji, many other industrial plantation and mining railways throughout the world. (The German, French, Austrian and most British military railway standard pre-1920)
1ft 6in	457mm	Used on many industrial and works lines
1ft 3in	381mm	UK (Pioneer agricultural lines in UK — Heywood), Romney Hythe and Dymchurch, Eskdale, (Australia — proposed for an ACT tourist line)
Zero	Zero	(France, Ireland — two Lartigue steam monorails), W. Germany — Wuppertal, (India — Patiala steam tramway)





Gladstone became a three-gauge station as a result of the Broken Hill-Port Pirie standardisation project. Here twin 830 class diesels are piloted through the yard on the first day of standard-gauge operation in 1970.

almost all of Australia's inland/port traffic (some Westrail bulk grain excluded) is already on unbroken gauge.

**LOST CHANCE.** Hindsight suggests that Sir Harold Clapp's great vision of the 1930s of standard gauge infill and inland links would have proved largely unnecessary today, and not all that commercially attractive. Some lines would in fact be a liability. More fascinating is what almost happened in Queensland when the Federal Government financed the Mount Isa/Townsville line upgrading some 25 years ago. The dominant traffics are copper to the coast and coal and oil inland, overlaid with some stock to the coastal abattoirs, and mostly container-based merchandise for the inland towns. It is not widely known that the Commonwealth offered to pay for upgrading this line on standard gauge. Had the Queensland Government accepted, it is highly probable that most of the subsequent Central Queensland coal developments would have followed on

1435mm.

Progressive relaying of all Queensland Railways tracks on long three-rail sleepers and, finally, gauge conversion of at least the key trunk routes (including the North Coast but probably not the Brisbane suburban and South-Western area) would have logically resulted.

Meanwhile, the Queenslanders have shown us the real possibilities of medium gauge in terms of bulk tonnage and, on the Gold Coast project, 160km/h design speeds. Only a VFT would exceed this on standard gauge. On the Sishen/Saldanha Bay line, the South Africans have recently run a 71,000t test train, having previously run elsewhere a 260km/h passenger train speed trial. So there is plenty of potential in what a former Queensland Railway Chief Civil Engineer once described as "1067mm, the standard gauge. . . here in Queensland". Still, the rejected Mount Isa offer remains a tantalising reminder of a watershed opportunity for radical change – an opportunity lost.





**V/Line's ballast-cleaning machine in action. Queensland Railways is having a similar machine built by Plasser Australia at St. Mary's, New South Wales.**

# QR CLEANS UP

**Q**ueensland Railways stands to save millions of dollars from a new ballast cleaner now being built.

The ballast undercutting and screening machine is being built by Plasser Australia at St. Marys, New South Wales, at a cost of almost \$3.5m.

Although a new venture for QR, other Australian and overseas railways have undertaken ballast cleaning using large-scale production machinery similar to that being bought by Queensland Railways.

Contaminated ballast is a problem for all railways, causing expensive maintenance and transport inefficiencies.

Queensland Railways has identified a number of savings resulting from ballast cleaning.

First, fewer long-term speed restrictions. On key sections of Queensland Railways' heavy haul lines these have a significant impact on revenue. Studies have shown that a 25km/h speed limit for 8km on the Hay Point to Coppabella section in Central Queensland would cost \$6m a year.

Second, ballast cleaning would reduce track circuit failures in the wet season caused by ballast contamination and poor drainage.

Electrical resistance between the rails is related to the degree of contamination of the track structure. Track circuits break down electrically in wet weather, impairing reliable train detection.

Third, strengthening the track structure with cleaned ballast will cut maintenance costs. For example, it will enable better management of the tamper-liner fleet in that times between track resurfacings will increase after settlement of new ballast. And other components in the track structure such as timber and concrete sleepers and fastenings will last longer.

The ballast cleaning machine consists of two units, the front excavating unit and the rear screening unit. These operate in tandem and are connected by automatic coupling devices. Each unit is about 27 metres long, with bogie centres of 20 metres. The bogies have two axles, with axle loads permitting the machine to travel and work on S and A class lines on the QR network.

The excavating unit undercuts ballast from the track structure with an endless cutter chain and propels the ballast via a series of conveyors to the

screening unit. Here it is cleaned over a three-tiered shaker system.

The treated ballast is returned to the track while the residue is dumped to the side or collected in spoil wagons.

Return rates of clean ballast are initially expected to vary from 10 per cent–30 per cent. Production rates of 170km a year are likely.

Before calling for tenders for the contract, QR engineering staff from the Chief Civil Engineer's branch and Chief Signal and Telecommunications Engineer's branch did a two-year study of the effects of ballast degradation and contamination. They found that once ballast becomes contaminated with fines from its own degradation under heavy axle loads and from external contaminants such as coal dust and clay from sub-base failure, it loses much of its interlocking ability, particularly when moist.

This failure in structural stability results in the railroad track being unable to hold its track geometry. A short-term solution is to use tamper-lining machines. As contamination increases, speed restrictions become necessary, especially in the wet seasons.

This directly effects the running times of trains and the ability of Queensland Railways to meet customer demands.



## COACH GOES INTO HISTORY

NEW HOME  
FOR ROYALTY'S  
RAIL PALACE

**A** rail coach used only by royalty and their representatives in Western Australia has been handed over to the Australian Railways Historical Society for preservation and safekeeping.

The handover marked the end of a distinguished and sometimes dramatic 72-year career for the vice-regal rail coach.

It was used by the Prince of Wales, later King Edward VIII, when he visited WA in 1920.

More than 40 years later, the Queen Mother enjoyed the comfort of the coach during her visit to this state in 1966.

The coach was derailed with the Prince of Wales and Lord Louis Mountbatten aboard while the royal party were heading for Pemberton during a tour of the south-west. Despite sliding down a railway embankment on its side, no-one was injured.

It has also been used by state government in their visits to country areas. Sir James Mitchell died in the coach shortly after finishing his term as governor.

The vice-regal coach, classed the AN 413 by Westrail, is distinguished by the royal crest on both sides, and a bath inside, the only WA coach with either of these features.

AN 413 also has two bedrooms, which shares the ensuite bath, a dining room,

kitchen, staff quarters with their own bathroom and toilet, and a comfortable observation lounge at the rear.

Westrail Commissioner Dr Jim Gill said the coach was a reminder of a pioneering period in WA's history, one in which the railways played a vital role.

"Times have changed, though, and the role of this type of coach in today's environment is limited.

It is appropriate that the pioneering spirit be recognised and remembered and the ARHS is well placed to do that."

For its last "official" trip, from City Station to the historical society's museum at Bassendean, the Vice-Regal Coach was drawn by another older timer, XA 1402, one of Westrail's first diesel electric locomotives. This loco is still being operated by the ARHS after being restored to its 1950s glory.

**The Governor of Western Australia's coach with its unusual observation window at the rear. In 1920, it slid down an embankment with the Prince of Wales and Lord Louis Mountbatten aboard.**





## LOOKING TO LIGHT RAIL

BRITAIN IS  
FOLLOWING  
WORLD TREND

**B**irmingham, Britain's second biggest industrial city, is looking forward to 1993 when its controversial light rail rapid transit system is due to go into operation.

The scheme, approved by Parliament in November 1989, will cross England's West Midlands, linking Birmingham and Wolverhampton. Another link will be with the National Exhibition Centre/Birmingham International Airport complex on the city outskirts, near Solihull.

Although some 200 cities and towns around the world have such systems, Britain has only the Docklands Light Railway in London and the Tyne and Wear Metro in North-east England. However, Birmingham's great rival in the north-west, Manchester, started work in 1989 on its own Metrolink system, due to roll late in 1991. Birmingham now expects to begin its take-the-cars-off-the-road project this year. A further system is planned for the city of Sheffield.

Cities such as Melbourne and some continental European cities have already found that light rail transit systems co-exist happily with pedestrians.

The Docklands Light Railway will still be the only fully automated system, running without drivers. Both it and the Tyne and Wear Metro run on their own reserved tracks. The Midland Metro and the



"It is great that Parliament has at last recognised that our proposals for Midland Metro are the best way of moving people around the region. It has been a long, hard fight but one totally justified. Now we have to put together a funding package – and I am certain we can do that."

The Midland Metro, which will create 3600 new jobs during its construction, will operate on a 20km section of existing railway line. By the end of the century, however, it should stretch for 180km, with stops just 700 metres apart. Metrolink, however, will operate more like trams. While the Manchester service will operate entirely above ground, Birmingham's will include an underground section.

Councillor Phil Bateman, chairman of the West Midlands Passenger Transport Authority, believes it is possible to raise the £1 billion (\$2 billion) cost from a combination of European Community, central, local government, and private sector funds.

**Sketch of a Midland Metro light rail vehicle due to go into service in Birmingham in 1993. The system is planned to stretch for about 180km, using vacant land and disused canal paths and railway lines.**

apart in the city suburbs. Both old railway lines and new tracks will be used.

The last trams ran in Birmingham more than 35 years ago. The new tram-style articulated railcars will run at speeds of up to 80km/h, powered by overhead electricity cables.

The intention is to provide a frequent service not only for shoppers but also for business commuters, three million of whom live within an hour's drive of Birmingham city centre. Officials predict the Midland Metro will carry about four million passengers in its first year, handling about 1800 an hour at peak times.

Much of the route will make use of derelict land and canal-side tracks, as well as disused railway lines, and will run right into pedestrian shopping precincts.

Planners forecast that the Midland Metro, as well as helping to boost tourism, will transform the region by aiding the economic regeneration of rundown areas. (LPS)



## MANAGING THE ASSETS

**D**emand management of assets is the theme of the Institution of Engineers, Australia's Conference on Railway Engineering (CORE) in 1991. The conference will be held in Adelaide, Australia, on 23-25 September 1991, and the institution is calling for papers. These need not be restricted to railway management.

The conference promises to be an interesting one because of the convenor's emphasis on innovative asset management principles that will take railways into the 21st century. The keynote speaker will be Mr Chris Green, Director, Network Southeast, British Rail.

Further details from: The Conference Manager, Conference on Railway Engineering 1991,

The Institution of Engineers, Australia, 11 National Circuit, Barton, ACT 2600, Australia. Telephone: (062) 706549; Fax: (062) 706530; Telex: AA62758.

## RAIL TRACK CONFERENCE

**T**he Rail Track Association of Australia and the State Rail Authority of New South Wales will be hosts for the eighth International Rail Track Conference in Sydney from 22-25 October 1990.

The theme for the conference, to be held at the Hilton International Hotel, will be "Resources for courses — on track for 2000". Speakers and delegates will focus on how best to redirect resources to the most cost-effective ends when technology does not supply all

the answers to railway problems.

Further details from 8 IRTC, PO Box 8, Seven Hills, New South Wales 2147. Telephone (02) 671 6555, Fax (02) 671 7875.

## SIGNALLING

**T**he Institution of Railway Signal Engineers will hold a three-day international conference on railway control in London from 7 to 9 October 1991. Titled ASPECT 91, the conference will cover automation, signalling, performance, equipment, control and telecommunications as applied to railway control.

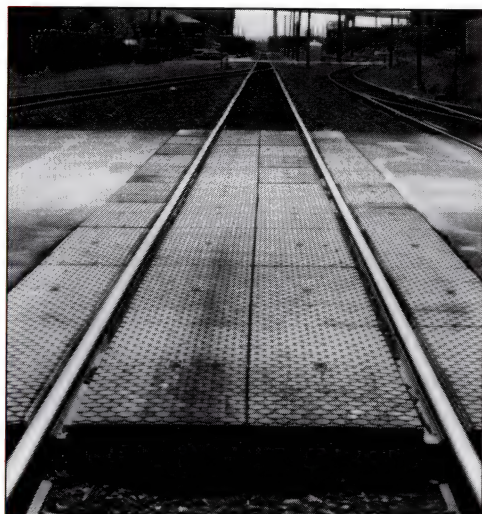
Further information from: Claire Henley, Secretary, I.R.S.E. International Conference, Area Signal and Telecommunications Engineers Office, British Rail, Dundonald Road, London, SW19 3QJ, UK.

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## TRACKS

# Victoria's bridges prove they were built to last

**V**ICTORIA'S STEAM-ERA BRIDGES TODAY HAVE TO HANDLE TRAFFIC THAT THEIR BUILDERS COULD NEVER HAVE FORESEEN. TO MAKE SURE THEY ARE UP TO IT, ENGINEERS HAVE PUT THEM THROUGH RIGOROUS ELECTRONIC TESTING — AND THE RESULTS ARE A PAT ON THE BACK FOR YESTERYEAR'S CRAFTSMEN. **ANN DE PAUL** REPORTS ON A FREEZING BUT REWARDING EXERCISE.

**L**ast winter, working in bitter cold and in the icy water and mud of river banks, a team of engineers tested the sturdiness of some of Victoria's steam-era bridges. Their mission: to find out whether V/Line's newest and strongest locomotives, hauling longer and heavier loads than the bridgebuilders had ever dreamed of, could use them in complete safety.

Some engineers — both inside V/Line and outside — had serious doubts about the strength of the old bridges.

The team started its work on the Nagambie bridge in July, and went on to examine others at Raywood, Tallarook, Wallen, Mangalore and Avenel in the following months.

None of the bridges had been tested before. But they came through their thorough electronic testing with high marks — a credit to their builders.

Now, the N Class passenger engines and the powerful G Class freight locomotives can haul heavier and longer loads across them at faster speeds. In customer terms, this translates into greater efficiency.

The operational savings are huge. And the capital cost saved by not having to upgrade 53 bridges is at least \$5m — a cost that would have been much higher if all bridges with 10-metre spans needed upgrading.

The engineering tests involved measuring the strain on the bridges when trains hauling specially weighted loads crossed at different measured speeds.

The investigation team consisted of Professor Paul Grundy of Monash University, two university researchers, and V/Line civil engineers Howard McTier and Ron Tregear.

"We spent many long winter hours wading through water, and you know how bitterly cold it can get in central Victoria," says Howard McTier.

The team spent up to 10 hours a day in the field carrying out complex tests including putting strain gauges on each end of a bridge, and in the middle of its span.

"And more gauges were placed on the underside of the concrete deck to check its movement in relation to the steel beams," Howard McTier says.

As more new locomotives are brought in to better serve the regions, V/Line hopes to extend the use of bridges without having to incur unnecessary upgrading costs.

Howard McTier says the engineers regard the test results as a reasonable indication of the condition of similar bridges across Victoria.

"The testing was rigorous. We used technology which wouldn't have been available just a few years ago to measure the stress factors involved with taking the weight and movement of laden trains.

"The gauges were connected, by 14 wires in some cases, to a computer we had in a four-wheel-drive vehicle, and load capacity was measured by a group of gauges called 'load cells' which were attached to the webs of the



**A V/Line passenger train powered by a P Class locomotive passing over Melton Weir (right), and (below) a V/Line country passenger train with an A Class locomotive on the Taradale Viaduct: two of the bridges that can handle heavier and longer loads at faster speeds.**

rails.

"We had tape recorders in the four-wheel-drive to record the sounds as the train passed – so we missed nothing at all."

Cost of the testing came to \$45,000. The main concern with the bridges involved a shortened section of the steel cover-plate on the beam flanges. It was designed 25 to 40 years ago to save on steel.

Structural design engineer Ron Tregear says that before the testing the general belief was that, while the bridges were safe, their structural capacity to carry larger and longer loads seemed limited.

"The testing told us about the level and distribution of stress so that operational decisions about locomotive running could be made more easily and reliably.

"We can also make better predictions about the life expectancy of a bridge with this advanced kind of technology," Ron Tregear says.

The first series of tests was on bridges with a conventional ballast track. The later series covered bridges with open deck timbers.

Work on each site took three days, and the best results came from tests done with a G Class locomotive hauling one or two 76-tonne wagons over the bridge at various speeds. The work was a credit to the team, the safeworking officers, the timetable clerks, train controllers and train crews, says Howard McTier.

"And of course, the bridges are a credit to their builders.

"It is really something . . . that bridges built for rollingstock dating back in some cases to the 1890s are quite capable of carrying modern locomotives with the heavier and longer rakes of wagons and carriages at today's higher speeds."





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## NEW PRODUCTS & PROCESSES

### MULTIPLE USE FOR FLEXIBLE CONCRETE FASTENER

**A** new flexible fastening system for concrete is looking for international markets. Winner of the Railway Engineering Award in Australia for 1989, the Multilok was developed by Amatek Rocla Concrete Sleepers (formerly Monier) in South Australia. It allows accurate placement of a variety of rail fastenings and lateral

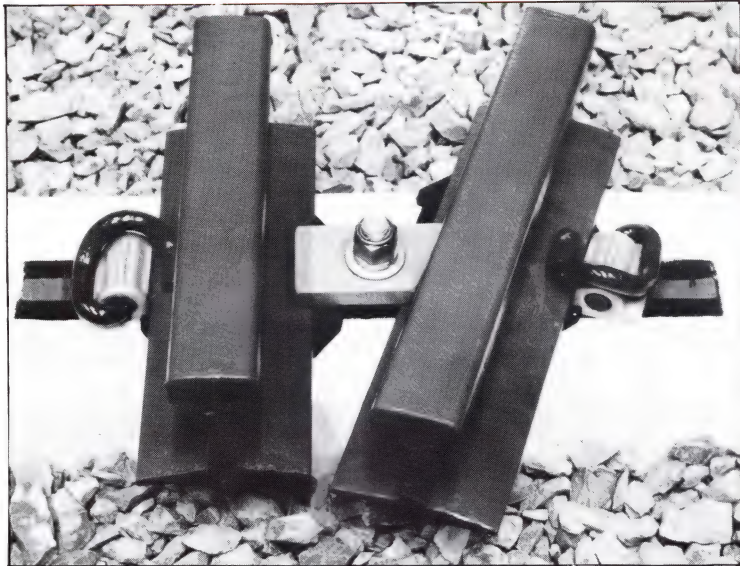
or rotational adjustment in the track without the need for special treatments or sleeper designs.

The Multilok system is being used for turnouts, gauge conversion sleepers and for spot replacement of sleepers.

The Railway Engineering Award is judged by the national committee for railway engineering of the Institution

of Engineers, Australia.

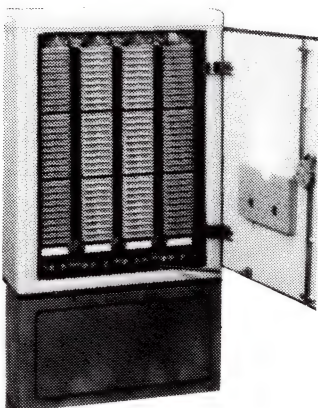
Multilok consists of a special cast ductile iron channel section embedded where a fastening is required in the top of concrete sleepers or slabs when pouring concrete. The channel section allows highly accurate placement of fastenings, which may then be grouted in place.



Turnout bearer set with Multilok, a special cast ductile iron channel section embedded where a fastening is required.

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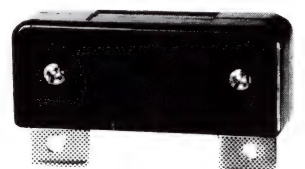
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MIMS software is under  
constant upgrading to  
incorporate technological  
advances and  
suggestions from users.



Multilok can accommodate a variety of fastenings to suit track requirements. Applications include turnouts, tunnel (slab track) sections, viaducts, guard rails, gauge conversion and spot replacement sleepers. Adjustment of fastener locations can be carried out at any time by removing the grout, relocating the fastener and then re-grouting. Although Multilok was designed for railway use, its versatility lends itself to many other applications in building and construction when used with a purpose-made 24mm diameter T bolt. Applications could include machinery or column holding down bolts, heavy duty wall panel fixings, and heavy duty anchorage on walls, columns, beams and slabs. Multilok was developed by a company team led by Bob Bratchell and John Middleton in 1987. Prestressed concrete turnout beams incorporating Multilok were produced at Amatek Rocla's Port Augusta plant in South Australia in late 1987 and subjected to testing by Techsearch at the SA Institute of Technology Laboratories in Adelaide.

The test results for Multilok exceeded all the requirements of Australian rail authorities specifications and the American Railway Engineering Association Manual for Railway Engineering, Chapter 10. Meeting these high standards means Amatek Rocla can market Multilok internationally.

The first turnout bearer set with Multilok was cast in New South Wales early in 1989.

In South Australia, gauge convertible sleepers with rail seats canted to 1 in 20 were made in 1989 with the new fitting and have been used in the first trials in Adelaide to Melbourne rail link. The concrete sleepers incorporating Multilok will permit conversion of the broad gauge to standard gauge in the future.

For more information, contact John Middleton, Amatek Rocla Sleepers 423 Brighton Road, Brighton, South Australia 5048. Telephone (08) 298 5900. Fax (08) 377 0234.

## AUSTRALIAN SOFTWARE FOR UNION PACIFIC'S OMAHA HQ

**U**nion Pacific, the largest US railway, has selected an Australian software system for its equipment maintenance and spare parts inventory management.

A Mincom MIMS software package valued at around \$A650,000 will be installed at Union Pacific's high-tech "command centre" in Omaha, Nebraska.

Mincom's US president, Gordon Jardine, described the sale as a recognition of Australian quality software. "The Union Pacific Railroad is a legend in the US and is recognised worldwide by other railways as the industry leader in rail technology," he said.

David Merson, Mincom managing director, said the MIMS system chosen by Union Pacific was one of the two contenders short-listed for the huge US Department of Defence SSRP project.

"In fact, Union Pacific and the Defence Department have chosen similar hardware and database environments," he said. "The sale to Union Pacific is irrefutable evidence that Australian-developed software can compete – and win – worldwide on its merits."

Gordon Jardine said: "In the two-and-a-half years since we introduced the MIMS system to the US, we've grown our US business from \$US400,000 to \$US6 million. And the Union Pacific business will drive further growth."

Union Pacific Railroad has a policy of investing in the best technology to stay ahead of its competition. The new Harriman Dispatch and Control Centre in Omaha is the railway's technology showpiece. \$US75 million has been spent on systems to control all its rail operations.

Mincom's software will be used to plan and monitor maintenance of both Union Pacific's equipment and the railway's thousands of kilometres of track.

"Maintenance of the track and the equipment has to be planned as an integral part of train operations so that such activities mesh in with, rather than obstruct, the revenue-generating freight operations," said Gordon Jardine.

"In a railway with 3,000 locomotives and so many miles of track, the potential for conflict between maintenance and operations is large. Mincom's MIMS system will play a key role in ensuring proper maintenance of the equipment and track, while minimising disruptions to freight operations."

The sale followed a visit by six Union Pacific staff to inspect Mincom's installation for Queensland Rail. Like Union Pacific, Queensland Rail covers a huge area, but UP is four times the size.

MIMS is used by Australian National, Westrail, and Victoria's The Met.


Mincom expects sales to other US railways and to railways in other countries where Union Pacific is highly regarded. South-east Asian railways in particular are already showing interest. Recently the Director of Civil Engineering of Malaysia's national railway, KTM, and a team from the State Rail of Thailand visited Mincom and MIMS railway sites.





***C'EST MAGA***



A photograph of a French TGV train in motion, blurred background. The train is white with blue and grey accents. The word 'TGV' is visible on the side. The background is a blurred landscape with a grey sky and a brown ground.

Record-breaking French  
TGV at speed south of  
Vendome on the southern  
arm of the TGV-Atlantique  
line.

**UNIFIQUE!**



# HOW FRANCE STAGED THE FIRST OF THE RECORD- BREAKING TGV RUNS THAT CHANGED THE FACE OF RAIL TECHNOLOGY.

**P**ERFECT, IT'S PERFECT," were the words which burst from Francois Lacôte, TVG design engineer, at the climax of the world record run on 5 December last year. It was 11.47, and the digital speedometers on TVG-Atlantique Set 325 had just registered 482.4km/h, or twice the take off speed of an A320 Airbus. The location was Km 166.6 just south of Vendôme on the southern arm of the TVG-Atlantique line.

Only 11 min earlier, Set 325 had eased away from Dangeau, 114km away from Paris Montparnasse on the common section of the Y-shaped TGV-Atlantique line which has been carrying commercial services at 300km/h since 24 September last year.

On the morning of 5 December, the specially modified set had left Châtillon depot in the Paris suburbs in company with Set 308, which had towed it to Dangeau, 114km from Paris Montparnasse. This was necessary because Set 325 had no 1.5kV DC pantograph for working over the DC tracks between the depot and the start of the new line electrified at 25kV 50Hz – both pantographs of the leading power car and the DC pantograph on the rear power car had been replaced by streamlined fairings designed to smooth air flows over the roof.

Set 308 was dispatched ahead from Dangeau in a procedure SNCF uses for all runs above 350km/h to ensure the line is clear and that track and catenary are in tip-top condition; maximum speed on the clearance run was 350km/h. The test team waited until the all-clear came from Set 308, which was stabled at St-Cyr-du-Gault, 190km from Paris on the Tours branch.

Set 325 then left Dangeau. By the time it reached the bifurcation with the Brittany branch of the TGV line at Courtalain it was travelling at 363km/h (special dispensation to take the points at a speed above the normal limit of

330km/h had been given).

Shortly after the junction begins a long gentle descent to the Loir valley, the final 2km before the Naveil viaduct over the Loir being on a grade of 0.2 per cent. SNCF calculated that the grade gave an advantage of 12km/h. Set 325 had accelerated to 450km/h by Km 149.5 and touched 480km/h at Km 166. A very light 5km/h northerly wind assisted the train, but the dense freezing air under a winter anticyclone was an adverse factor.

The 96km trip ended at Vernou-sur-Brenne, near the Vouvray tunnel east of Tours. A speed of 400km/h was sustained for 45km and 450km/h for 22km.

On board the record-breaker with Lacôte were TGV-Atlantique New Line director Étienne Chambron, deputy general manager Roger Gérin who was in command in the cab, head of testing Pierre Delfosse, and 50 other technicians and engineers from SNCF and main contractor for the Atlantique trains GEC Alsthom.

## Program of trials

**T**he trip on 5 December represented the climax of a long programme of trials and component

tests which began in the mid-1980s. All was readied during November last year, and the series of ultra-high speed runs began on 30 November. Set 325 was scheduled to make three trips a day. A new world record of 442.6km/h was established on 1 December, and after some adjustments to the pantograph, the first two trips on December 4 reached 463 and 473km/h respectively. Hopes of a higher speed on the third trip were dashed when traction had to be cut at 463km/h because two circuit breakers tripped.

The maximum of 482.4km/h was attained in the second trip on the following day. Two days later, a demonstration run was staged for

the press; Transport Minister Michel Delebarre and Research Minister Herbert Curien were among the 100 or so people on board who experienced rail travel at 475.1km/h. Afterwards, Lacôte pointed out that this was "the twelfth trip we have made at 420km/h or more".

Asked to explain SNCF's objectives, Lacôte said the trials were "to explore speeds in the 400 to 500km/h range. Our target was 450km/h".

The maximum had been reached after a gradual build-up, with each run peaking at a slightly higher speed than the previous one. Each time hundreds of parameters were checked before the next run went ahead.

The way had been paved for the record-breaker by Set 308, which last August had attained 390km/h with eight trailer cars. The previous month, Set 325 had been assembled for preliminary trials with 10 trailers, including those to be used later for the record, but it did not emerge in its record-breaking configuration until September 24. Five months were spent preparing it and fitting instrumentation for ultra-high speeds, only a few nocturnal sorties being made to verify and calibrate equipment.

## Reduced formation

**T**he composition chosen for Set 325 was two power cars enclosing four trailers, total weight being 291.6 tonnes; two of the trailers were built by De Dietrich.

The leading trailer was converted into a running laboratory housing a mass of instrumentation monitoring all vital electrical and mechanical components. The second trailer was a bar car required to carry and dispense champagne; it was fitted out at one end as a mini-conference area with telefax machine. The other two cars were second class vehicles each fitted





**'WE ARE A  
LONG, LONG  
WAY FROM  
THE LIMITS OF  
WHEEL-RAIL  
TECHNOLOGY'**

TGV DESIGN  
ENGINEER  
FRANCOIS  
LACÔTE

**O**n Friday 18 May 1990 at 10.06 am, the TGV, with the French Transport Minister, Mr Michel Delebarre, aboard, set a new world speed record of 515.3km/h after an endurance testing campaign carried out on the TGV-Atlantique line in western France between Courtalain and Tours, about 150km from Paris. The TGV had already reached 510.6km/h on Wednesday 9 May and 510.8km/h on Wednesday 16 May.

Engineers and technicians in the TGV laboratory car monitor equipment as Set 325 establishes the new world record.



with two banks of three video monitors linked to cameras installed in the cab, the laboratory car and on the roof to monitor pantograph behaviour. A similar array of monitors was provided in the bar.

Special measuring equipment was fitted to the axles of the leading bogie of the front power car and the first articulation bogie. and radar measuring devices were installed between the rear power car and the adjacent trailer. Speed recording equipment was also installed at the lineside.

The drive train had been thoroughly tested at SNCF's Vitry research establishment, and the axleboxes had been "run in" on a Paris-Sud-Est TGV set to accumulate 10 000km. The gear ratio was altered so that the motors were turning at 4 000 rev/min at 400km/h instead of 300km/h, and wheels 1 050mm in diameter instead of 920mm were fitted.

The main transformer in each power car was modified for a higher output, and the synchronous traction motors uprated from 1 100 to 1 500kW to give a total continuous rating of 12 000kW. Temperature of axleboxes, traction motors and other equipment was under constant surveillance, with accelerometers monitoring the dynamic behaviour of mechanical parts. Special care had been taken in selecting and verifying the electronic components to guard against failure at a critical moment.

Each of the Y237 bogies was fitted with four extra anti-yaw dampers, and the lateral dampers were adjusted to absorb higher forces. During trials a year earlier with TGV Set 88, SNCF engineers had deliberately tried to induce instability at high speed with a bogie fitted with new wheels and weak anti-yaw dampers. They failed to do so, confirming that the dynamics of the bogie were correct. Lacôte insists that no bogie instability occurred on the record run: "The dynamics of the bogie are completely correct."



Other changes included inflation of the SR10 secondary suspension airbags on the trailer cars to absorb larger oscillations and to raise body height by 10mm, so minimising the difference in roof height between the trailers and the power cars with their larger wheels.

**T**he four braking rheostats supplied by Metal Deployé were modified to improve the transfer of heat from the resistance to the surrounding airflow, and the disc brakes on the trailing axles were adjusted to raise the braking effort from 18 to 24MJ per disc.

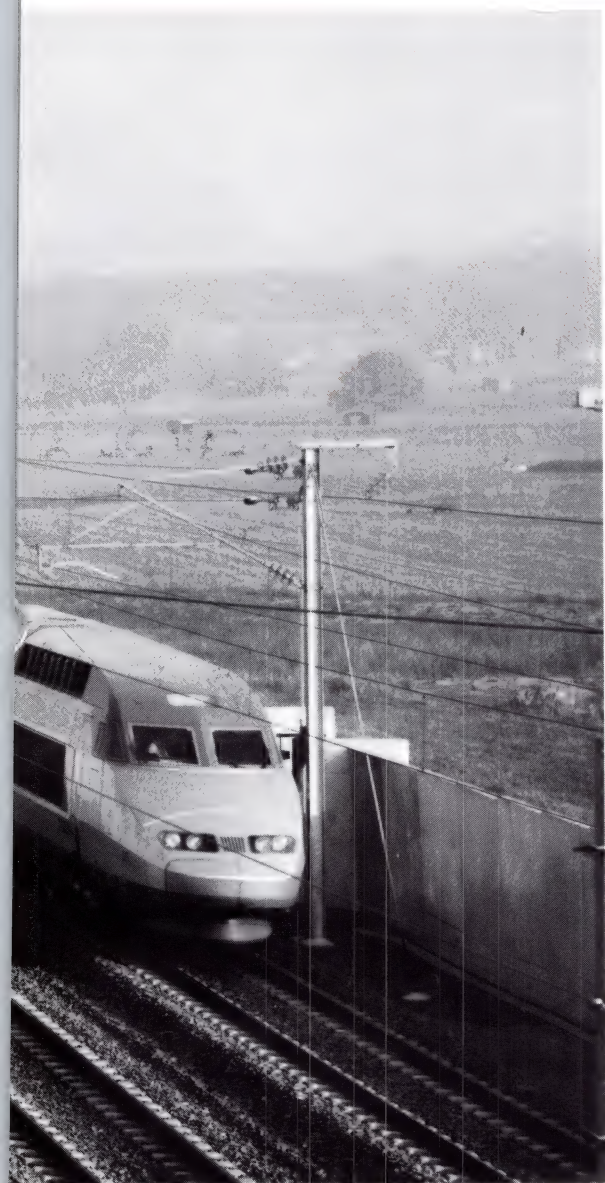
Many of the components were tested on TGV Set 88 during a series of high-speed runs in December 1988, when the world

record speed of 406.9km/h reached by the German IC-Experimental set in May of that year was unofficially beaten. At the time, SNCF officials would not reveal the true speed that had been attained, only commenting that "we are saying we have reached 410km/h", Lacôte said last month that the maximum was in fact 408.8km/h.

The test zone near Vendôme features curves of 15 000m radius, although near Courtalain the minimum radius is 6 000m.

Apart from reinforcing the structure of the Navell viaduct over the Loir, no alterations were made to structures. Nor was the track modified for the ultra-high speed trials, although small pieces of ballast that might fly up in the slipstream were removed. The track had been tamped and lined using a computer program





**TGV Atlantique Set 325 on the viaduct of Aveil (Loir et Cher) during its trial run to beat the world rail speed record in December 1989**

developed by Framaker, and a battery of track machines was on hand near Courtalain to make adjustments between trials if necessary.

Installation of pointwork at Vendôme station has been deliberately delayed until the ultra-high speed trials are completed – the station site is close to the zone of maximum speed. The track in this area was instrumented to measure any displacements occasioned by the high speed runs. Many other measurements were taken, including noise and electromagnetic interference.

Throughout the tests catenary voltage was maintained at 28 instead of 25kV, but the standard 150m<sup>2</sup> diameter contact wire was retained.

On the evening before the record run, Roger Gérin decided that the tension in the catenary should be

increased to 28kN; on the first two days of the trials tension was increased from 20 to 27kN. One section of the catenary was a prototype of the design chosen for TGV-Nord.

The Faiveley GPU pantograph mounted on the rear power car of Set 325 is a double stage design, the cylindrical plunger being free to move by up to 150mm; the dynamic mass of the cylindrical structure is just 8kg.

Current collection seems to be the main technical obstacle to attaining even higher speeds. Sensitive to aerodynamic phenomena, contact between pantograph and catenary is a delicate area already finely tuned, and a critical speed is reached when the rate at which wave motions are propagated along the catenary is approached. During the high-speed trials in February 1981, which saw a world record speed of 380km/h attained on the Paris-Sud-Est line, the wave propagation speed in the catenary was 460km/h.

Still to be tested is current collection at high speed under DC catenary – the 17km Tours bypass will be wired at 1.5kV DC and worked at 270km/h.

## The way ahead

In Autumn 1988 SNCF revealed that TGV-Nord would be designed for speeds of 325 or 330km/h, but there is now a possibility of even higher speeds in commercial service in the medium to long term.

Any suggestion of raising maximum speed on the TGV-Atlantique line to 330km/h in the immediate future is quashed by Lacôte. "We are a prudent and responsible company," he says, and no decision will be taken until they have enough experience with operations at 300km/h. Nonetheless Étienne Chambron points out that "the knowledge gathered is precious to us for the day when we decide to operate faster than we do at the moment

– in commercial service".

SNCF engineers were watching closely for any emergence of unusual phenomena at speeds above 400km/h. Lacôte says that nothing extraordinary occurred: "The great impression one is left with is that there is no impression... you see the countryside going past faster, but you get used to the speed very quickly. There is a long, long way to go before the limits of wheel-rail technology are reached."

The exploit on 5 December not only restored the official blue riband for the world's fastest commercial rail vehicle to France, but it also consigned a number of other records to history. Among these was the dash by the air cushion Aérotrain 250-80 at 428km/h in March 1974, and the 410km/h attained by a Garrett vehicle powered by linear motors and jet engines on standard gauge track at Pueblo, Colorado, in the US in August of the same year.

The speed of 418km/h reached by West Germany's Transrapid 06 maglev test car on 1 June 1988 is expunged, and a fresh attempt on 18 December attained no more than 435km/h. Only the 517km/h reached by an unmanned maglev vehicle in Japan's Miyazaki test track in December 1979 is still unbeaten. Lacôte said there were no plans to go beyond this.

Among those the French intended to impress were the South Koreans. President Roh Tae Woo had been treated to a special trip on the TGV-Atlantique line on 2 December, but on that occasion maximum speed was limited to 300km/h. The Korean President's visit followed a symposium on high-speed railways in Seoul last year which was attended by French specialists hoping to sell TGV technology for the proposed Seoul-Pusan high-speed line. The sales effort continued on 7 December; among those on board the press trip was the Korean ambassador to France, Mr Han Woo Suk.





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### **Making Tracks: 46 Years in Australian Railways**

**By R. J. Fitch**

Kangaroo Press, 1989, \$29.95

# FROM ENGINEER'S TENT TO EXECUTIVE DESK **STAYING ON THE RAILS**

**I**n his early career, as a civil engineer with the West Australian Government Railway, Ronald Fitch excavated railway reservoirs with plough, scoop and teams of "magnificent Clydesdales." These were to serve the new branch lines in the spreading wheatlands, lines laid by "manual labour at its best." This book, with its striking photographs, helps bring back that world of sweat and toil that now seems so distant.

Rail construction ended with the crash of 1929-30 and track maintenance shrank, almost ceasing during the years of World War Two. A Royal Commission in 1947 found WAGR "almost completely run down" — and then proceeded to blame not the governments that had imposed savage economies but the railway administrators for what it called "inadequate protest". Fitch forthrightly refutes the charge, providing the background for a full appreciation of the resurgence of Westrail.

Ronald Fitch joined the Commonwealth Railways in 1949 as Chief Civil Engineer. These were the last years of steam. Locomotives depended on coal brought in through Port Augusta and on bores for water. One 650km stretch on the east-west line had no regular water supply relying on tanker trains. Given the capriciousness of both pumps and treatment plants, water was always "the biggest day-to-day worry".

Long-haul diesels, introduced in 1951, brought "startling" benefits, Fitch recalls. They also eliminated many water supply halts, however, making maintenance missions, over distances up to 1700km, lonelier than ever. The Chief Engineer carried his own official swag and shared the

spartan comforts of roadside rest houses with his men.

On the narrow-gauge central Australia lines, the badly-worn rails, often deeply sunk into "broomed out" sleepers, reminded Fitch of "strands of heavy gauge fencing wire". As the first-rate photographs show, flash floods could twist track into coils or leave it in mid-air where a bridge had been swept away.

Fitch inherited a maintenance division "near to breakdown" and a bitter dispute concerning the 300km of line linking new power generators at Port Augusta with coal deposits at Leigh Creek. Traffic estimates called for a new standard-gauge line. CR had also proposed a new route to the west of the Flinders Ranges to take advantage of easier gradients. SAR argued for the old route, which would maintain their link with the Commonwealth line at Quorn, ensure the continued well-being of the railway community there, and strengthen the claim for standardisation of the adjoining division.

The dispute was referred to a Royal Commission, to which Fitch was appointed as CR representative. Not only did the CR proposal prevail, but Fitch became assistant to the SAR commissioner three years later, and commissioner in 1966.

No state could be more damaged by the introduction of a third gauge limited to interstate or truck routes only. Conversely, no state stood to benefit more from planned regional implementation of the railways standardisation proposals of 1949. The decisions, however, now rested with the Commonwealth government. The massive task of post-war rehabilitation had clearly

demonstrated the power of the purse.

The new standard-gauge Port Pirie-Broken Hill line, finished in 1969, reflected the over-riding concern with a direct Sydney-Perth rail link. Nationally the rail pattern was transformed, but state and local needs in the adjoining rail divisions had been largely ignored. Even a complementary link with Adelaide had been postponed.

At various points on the new line, two gauge yards were reconstructed to accommodate a third gauge, and this as part of a standardisation project. Readers are assured that savings on the new ultra-complicated signalling alone would have contributed substantially to the cost of standardising branch lines to the north, which was left almost severed from the main system.

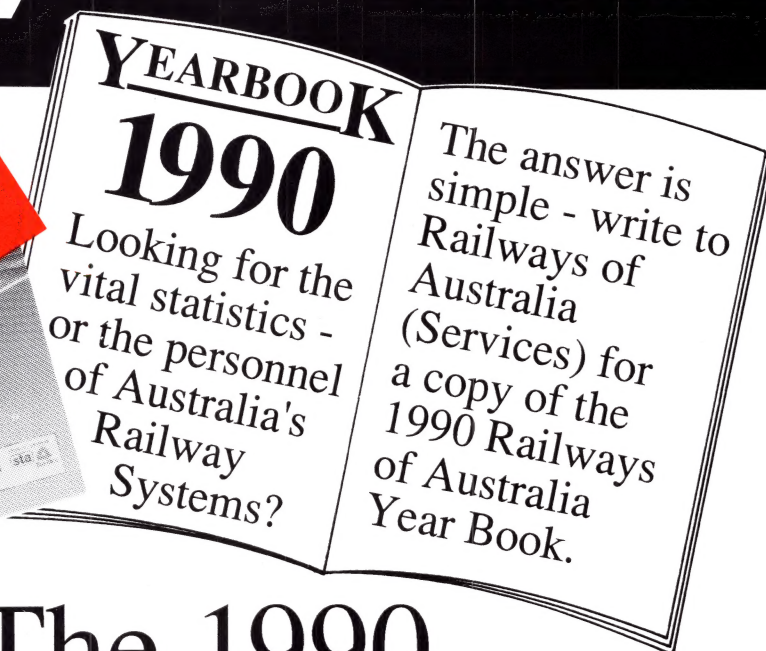
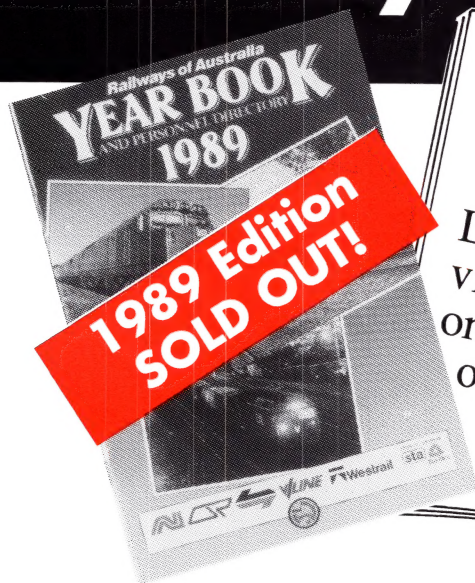
And when a standard-gauge Port Pirie-Adelaide link was being considered in 1970, a new \$35 million line was proposed; the SAR proposal to correct the existing heavy duty broad-gauge line was costed at a fraction of that amount. The SAR proposal was to prevail eventually, however.

By then, the fragmentation of SAR had led to the absorption of Adelaide suburban services by the State Transport Authority and the transfer of all else to a newly constituted ANR. South Australia and Tasmania at the same time had "relinquished for all time the right to determine transport policy within their own borders."

Closing chapters on a wide range of railway people he met or served with, and on "Australian Trains, named and nicknamed" supplement these recollections of a career ranging from the construction engineer's tent to the executive desk.



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